Studies in Computational Intelligence 1056

Muhammad Alshurideh · Barween Hikmat Al Kurdi · Ra'ed Masa'deh · Haitham M. Alzoubi · Said Salloum *Editors*

The Effect of Information Technology on Business and Marketing Intelligence Systems

Springer

Studies in Computational Intelligence

Volume 1056

Series Editor

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ISSN 1860-949X ISSN 1860-9503 (electronic)
Studies in Computational Intelligence
ISBN 978-3-031-12381-8 ISBN 978-3-031-12382-5 (eBook)
https://doi.org/10.1007/978-3-031-12382-5

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This Springer imprint is published by the registered company Springer Nature Switzerland AG
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

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Social Marketing and Social Media Applications

Assessment of the Perception of Usage of Facebook as a Business Tool in SMEs Through the Technological Acceptance Model (TAM) and Structural Equation Modeling

Mohammed T. Nuseir, Ahmad I. Aljumah, Ghaleb A. El Refae, Muhammad Alshurideh, Sarah Urabi, and Barween Al Kurdi

Abstract The implementation of novel technologies such as social networks is altering the landscape of contemporary Small and Medium Enterprises (SMEs) including the ones located in UAE. The purpose of this research is to define the extent of technological acceptance of Facebook in business activities through the Technology Acceptance Model (TAM). To achieve this, the structural equation modeling

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_1

is employed with the application of 130 surveys. Empirical evidence displays positive significance in most of the constructs such as Perceived Usefulness, Easy to Use, Intended Use, Attitude of Use and Current Use and also suggests the lack of a culture regarding the use, handling, and acceptance of Facebook as a marketing tool in most businesses consulted.

Keywords Facebook · Technology acceptance model · SME · SEM

1 Introduction

The existence of millions of users on social media sites is characteristically attractive for companies because it opens up novel means to interact with customers and other important stakeholders, like employees and suppliers (Aljumah et al., 2021a; Al-Maroof et al., 2021a; Nuseir et al., 2021b; El Refae et al., 2021). For this reason, different types of organizations around the sphere are aiming to assimilate social media in their numerous facets of business operations and processes (Al Khasawneh et al., 2021a, b; Al Kurdi & Alshurideh, 2021; Bhanot, 2012). Culnan et al. (2010) stated that social networks are changing the ways traditional communication of human beings, who have advanced with the usage of novel channels to becoming a tool which is founded on the creation, generalized trust and shared knowledge.

In the view of Ahmad et al. (2019), the main activities of the Internet in UAE are the use of social networks, which occupy the first place, while statistical data company Global Media Insight shows that UAE has 9 million users on Facebook, which represents an area of opportunity for companies because of the large number of potential customers (GMI, 2018; Nuseir et al., 2021a; Radcliffe et al., 2019).

However, despite the benefits and uses that social network can provide to the organizations (Alhamad et al., 2021; Al-Hamad et al., 2021; Alshurideh et al., 2016, 2019c), there are many managers who have not decided to venture into this type of technology (Ahmad et al., 2019; Al Kurdi et al., 2021a; Alshurideh et al., 2021a, b; Culnan et al., 2010). Therefore, the purpose of this investigation is to examine the degree of technological acceptance of Facebook in SMEs (trading and services firms), located in Dubai International Financial Centre in Dubai and Khalifa Industrial Zone in Abu Dhabi, UAE, through the Technology Acceptance Model (TAM) proposed by Davis (1989), Akour et al. (2021), and Almazrouei et al. (2020).

To achieve this goal, a literature review was conducted and the application of a survey of 130 SMEs was performed. Afterward, the data obtained were analyzed by the technique of Partial Least Squares (PLS). Finally, this paper is structured as follows: the first section reviews the literature, and the next one provides the description of the method and the proposed model; followed by analysis of the results, and finally in the last section the main contributions to the knowledge obtained are shown.

2 State of the Art

2.1 Social Networks

Social networks are altering the participation and commitment of users; consequently, businesses have concentrated on their benefits, since the extensive usage of the Internet and its tools has meant the advent of a communication channel that permits to collaborate with a lot of people on a daily basis (Al-Dmour et al., 2021a; Al-Khayyal et al., 2021; Guesalaga, 2016). Increasingly, more and more individuals are using online format to interrelate and share experiences (Al Kurdi et al., 2021b; Alshurideh et al., 2012b; Hamadneh & Al Kurdi, 2021; Joghee et al., 2021; Radcliffe et al., 2019). Some studies contemplate the usage of social networks as one of the fundamentals of change in the manner SMEs compete in the global world, and that its examination can be an excellent tool for gaining pertinent information (Aburayya et al., 2020a, b, c, d; Al Suwaidi et al., 2021; Al-Khayyal et al., 2020; Baró & Costa-Sánchez, 2017; Radcliffe et al., 2019).

Moreover, social networks are component of the digital marketing as they propose exchange of ideas amongst participants and allow the advertisement of products, services or brand openly to existing and potential customers (Abu Zayyad et al., 2021; Alaali et al., 2021; Alshurideh et al., 2015b; Elsaadani, 2020; Sweiss et al., 2021). As per Baró and Costa-Sánchez (2017), there are different social networking platforms such as blogs, online communities like Twitter, Facebook, Wikis, forums, etc. which can be employed by SMEs to increase awareness and share content or information to surge the visibility, prestige and popularity of a brand or company. These platforms have the benefit of permitting direct collaboration with consumers without the requirement for a considerable investment; so, assist in decreasing in marketing costs (Agha et al., 2021; Al Kurdi et al., 2020a; Al-Dmour et al., 2021b; Kurdi et al., 2020a; Madi Odeh et al., 2021; Prantl & Mičík, 2019); lower the costs of technical services (Aljumah et al., 2021b, c; Felix et al., 2017) or even promote the formation of emotional ties and reinforce the levels of loyalty to the services, products or business (Zhang et al., 2019). As a result, creating a marketing campaign effectively on social networks saves on advertising, as well as generates a kind of advertisement, which is better received by customers, since it is likely to create a closer relationship with them, eventually creating brand loyalty (Al-Dmour et al., 2014; Alshurideh et al., 2012a, 2019b; Alshurideh, 2016a, b, c, 2017, 2019; Obeidat et al., 2019). To attain good results, it is significant that SMEs interrelate day-to-day in social networks and display an interest in taking part in these communication platforms, together with nurturing consumer relations (Al Kurdi et al., 2017; Alshurideh et al., 2014, 2020b; Alyammahi et al., 2021; Alzoubi et al., 2020; Guesalaga, 2016; Hayajneh et al., 2021; Zhang et al., 2019).

According to a study by Lin and Kim (2016), Facebook is the social network with the largest brands which reflects that 59% of those who follow a brand in social networking channels have been affected in their procuring choices. Moreover, Bogea and Brito (2018) state that social networking platforms enhance business prospects,

yield and stay in the market as well as bringing it closer to consumers and potential customers, networking with companies and people, counting its clients in developing their position and business itself as a standard in its sector.

2.2 Technology Acceptance Model

At present, the optimum usage of IT within SMEs is a requirement, keeping in view its effect on the generation of services and goods. This, together with social networks, is turning out to be more affordable in the market; nevertheless, proper management is more important than the investment (Alshurideh et al., 2019a, d; Lin & Kim, 2016; Nuseir et al., 2021c). Consequently, in contemporary years, various studies have concentrated on recognizing the factors which affect acceptance behaviors in the case of technology by the end-users (Alshurideh et al., 2017; Nikou & Economides, 2017; Scherer et al., 2019).

This resulted in the existence of different models and theories to measure the acceptance of technology; among which the Technology Acceptance Model introduced by Davis (1989) is most significant. It is an extremely effective model in forecasting the usage of IT (Kurdi et al., 2020b; Lin & Kim, 2016). The model has its origins in the Theory of Reasoned Action (TRA) but replaces several measures of attitude of the TRA model to predict behavior, acceptance and intended use of the technologies by individuals (Abuhashesh et al., 2021; Al-Maroof et al., 2021b; Lai, 2017).

As per Al Kurdi et al. (2020b), Alshurideh et al. (2020a), Amarneh et al. (2021), and Lai (2017), the model attempts to predict the technology acceptance based on two main variables: the *perceived usefulness*—the extent to which an individual believes that employing a specific system enhances performance and the *perceived ease of use*—the extent to which an individual believes that employing a specific system, one can free oneself from the effort it involves performing the work.

Moreover, in the view of Al-Qaysi et al. (2020), the model proposes that when customers are presented with an innovative technology, several factors affect their decision on how and when to employ. According to Davis (1989), the primary aim of the TAM is to elucidate the reasons of approval of technologies by users. Therefore, the model suggests that views of an individual in perceived usefulness and perceived ease of use of technology are categorical to define their intent to employ it (Al Kurdi et al., 2020b; Alkitbi et al., 2021; Al-Qaysi et al., 2020; Bettayeb et al., 2020; Lin & Kim, 2016).

Moreover, the literature review allowed us to detect the lack of studies related to social and TAM networks in UAE; however, it was found that in other dimensions exist, but in a limited amount. One of these studies examined the adoption and use of social networking by users including model aspects such as trust and perceived risk to them, the results of this study support a relationship and positive influence among the variables (Biswas, 2016). Similarly, another study was carried out to recognize the variables that affect the inclination to use the social network for their purchasing

decisions. The outcomes of this study specify that the anticipated usage of Facebook in purchasing decisions is affected by the attitude, social influence, and perceived usefulness. In addition, this study recognizes that perceived enjoyment could have a vital part, even more than the perceived usefulness in defining an individual's attitude to Facebook as a tool for discovering info about the good to purchase (Aissani & Awad ElRefae, 2021; Alshurideh et al., 2021c; Singh & Srivastava, 2019).

3 Method

This study presents a conceptual model in which it is proposed that the attitude of use is affected by the ease of use and perceived usefulness, the latter also inferred by the ease of use. In the same way, both perceived usefulness and attitude of use are direct antecedents of intended use, which influences the perception of the current use of certain technology. Figure 1 shows the model and the causal relationships among the variables.

Moreover, the assumptions of the testing model for the proposed research are summarized in Table 1.

Regarding the process of creation of the instrument, it was based on the literature review, which allowed us to detect different models of operationalization of the variables related to the subject, which have been used successfully in different studies. Therefore, the first draft of the instrument was sent for review to a group of researchers and practitioners in the area. Each expert was received their opinion on the consistency, relevance and clarity of the items-factors proposed. Afterward, a pilot study was conducted and the questionnaire consisting of 29 items, of which 8 were multiple and 21 were Likert scale responses of 5 points (5. Strongly agree and 1. Strongly disagree) and were sent to different SMEs through e-mail. The responses were received back within the period of 30 days.

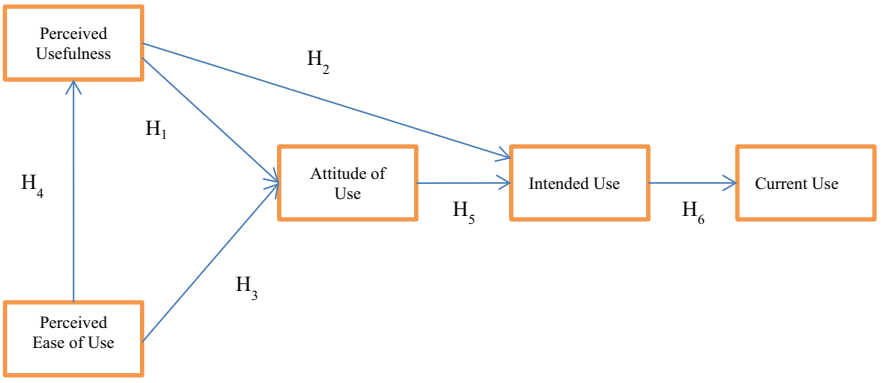

Fig. 1 Theoretical model to test

Table 1 Summary of hypotheses

Variables	Hypotheses	References
Perceived usefulness	H1. Perceived usefulness of the SMEs regarding social network Facebook has a positive influence on the attitude of use of social networking as a marketing tool	Davis (1989)
	H2. Perceived usefulness of the SMEs regarding social network Facebook positively influences the intention of use of social networks as a tool for marketing	Davis (1989)
Ease of use	H3. Perceived ease of use Facebook as a marketing tool has a positive effect on the attitude of use in SMEs	Davis (1989)
	H4. The effect of the ease of use Facebook perceived by SMEs is positive in the perception of usefulness	Lane and Coleman (2012), George et al. (2014)
Attitude of use	H5. Affects the attitude of entrepreneurs positively regarding intended use of Facebook as a marketing tool	Biswas (2016)
Intended use	H6. The intended usage of Facebook as a promotion tool by SMEs positively influences their current use of this social network	Sell et al. (2012), Lin and Kim (2016)

The sample was obtained by the UAE Chamber of Commerce and Industry for the year 2019 which registered 2,800 SMEs located within the established geographic locations (Dubai and Abu Dhabi) for research. After getting the authorization with different Chambers and Associations of Commerce, locations selected implementing the instrument were handled. Fieldwork was conducted through a convenience sample between the months of September to December 2019, through site visits and explaining to the research subject the aim of the study; in this case, the primary informants included were general and marketing managers.

4 Results

After applying and accounting information, the results reveal that the sample is comprised of companies in the trade sector with 71.14% and 28.86% services. This coincides with data from the economic census of economic units conducted by GMI (2018), which states that in Dubai and Abu Dhabi, commercial enterprises

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represent the most economic units. Also 49% of SMEs have 0–10 employees, 30% of SMEs have 11–30 employees and 21% of SMEs have 31–100 employees. The research participants were also asked to indicate the positions they play within the organization, obtaining the highest percentage of respondents were owners (44%).

Moreover, to check the model, structural equation modeling (SEM) was applied using the statistical technique called PLS through MS Excel 2010. This requires technical evaluation of the quality of the model before obtaining structural validation (Queiroz & Fosso Wamba, 2019). Therefore, the researcher conducted tests of the main criteria of quality, beginning with the analysis of individual reliability of the item, which states that to accept an indicator as part of a reflective construct, this must have a factor loading (λ) or 0.707 or above simple correlations (Al-Maroof et al., 2021a). Taking the above acceptance criteria ($\lambda \geq 0.707$), the FU3 and FU4 indicators were eliminated. Table 2 shows the results.

Continued with the quality tests of the model, the next phase is to determine the reliability of the construct, which is evaluated by Cronbach's alpha (α) and the coefficient of composite reliability (ρc), in both cases, their performance is similar. Therefore, guidance provided by Achjari (2004) who suggests 0.7 as a reference point is used. Table 3 shows the results and as noted, all constructs have a satisfactory internal consistency and are reliable.

Moreover, the researcher also calculated the Average Variance Extracted (AVE). This ratio indicates the amount of variance that a reflective construct gets from its indicator's comparative to the amount of variance because of the measurement error and its value must be greater than 0.5 (Manerikar & Manerikar, 2015) and as shown in Table 4 all AVE measures are valid.

Table 2 Reliability of single items

Attitude of use (AU)				Intended use (IU)				Current use (CU)			
Item	λ		T-statistic	Item	λ		T-statistic	Item	λ		T-statistic
AC1	0.81	***	17.50	INT1	0.84	***	23.38	UA1	0.93	***	53.07
AC2	0.91	***	43.85	INT2	0.92	***	68.89	UA2	0.95	***	110.03
AC3	0.91	***	38.95	INT3	0.88	***	28.64	UA3	0.75	***	9.09
AC4	0.91	***	49.93	INT4	0.92	***	69.52				

Ease of use (EU)				Perceived usefulness (PU)			
Item	Λ		T-statistic	Item	Λ		T-statistic
FU1	0.74	***	9.94	UP1	0.81	***	18.90
FU2	0.78	***	14.90	UP2	0.90	***	46.14
FU3	**0.59**	***	7.54	UP3	0.87	***	27.80
FU4	**0.61**	***	6.17	UP4	0.90	***	35.70
FU5	0.82	***	16.90	UP5	0.88	***	36,15
FU6	0.77	***	12.75	UP6	0.88	***	38.40

***Value t > 3.31 ($p < 0.001$), **p value > 2.58 ($p < 0.01$), *p value > 1.96 ($p < 0.05$)

Table 3 Reliability of the construct

Constructs	Cronbach's alpha (α)	Composite reliability (ρc)
Perceived usefulness	0.942	0.949
Easy to use	0.807	0.865
Intended use	0.919	0.943
Attitude of use	0.911	0.938
Current use	0.874	0.916

Table 4 Validity convergent

Constructs	Factor
Perceived usefulness	0.775
Easy to use	0.565
Attitude of use	0.792
Intended use	0.805
Current usage	0.787

Finally, the values were analyzed, and the correlation matrix constructs made by the square root of the coefficient of each AVE obtained, indicating that these values should be higher than the rest of the same column (Manerikar & Manerikar, 2015). As shown in Table 5, constructs meet this criterion.

Once it has been verified that the constructs are valid and reliable, the researcher proceeded to calculate the magnitude and weight of relations between different variables, using the above two indices proposed by Radcliffe et al. (2019): (i) The Explained Variance (R^2)—which determines the predictive power of the model; therefore, their values must be equal to or greater than 0.1 since little information; and (ii) the standardized coefficients path (β), which show the strength of relations between independent and dependent variables, so their values need to reach the least significant to 0.2 and as seen in Table 6 the values obtained for R^2 are within suitable ranges.

Table 5 Discriminant validity

Constructs	Attitude of use	Ease of use	Intended use	Current use	Perceived usefulness
Attitude of use	**0.890**				
Easy to use	0.438	**0.751**			
Intended use	0.848	0.396	**0.897**		
Current use	0.363	0.350	0.423	**0.887**	
Perceived usefulness	0.801	0.481	0.768	0.444	**0.880**

Table 6 Explained variance (R^2)

Constructs	Explained variance
Perceived usefulness	0.232
Attitude of use	0.645
Intended use	0.741
Current use	0.179

Table 7 Results of the structural model

	Hypothesis		Coefficient (β)	t values	p values
H1	Perceived usefulness -> Attitude of use	+	0.768	13.618	0.000
H2	Perceived usefulness -> Intended use	+	0.247	2.941	0.003
H3	Easy to use -> Attitude of use	+	0.069	1.160	0.246
H4	Easy to use -> Perceived usefulness	+	0.481	6.223	0.000
H5	Attitude of use -> Intended use	+	0.650	8.037	0.000
H6	Intended use -> Current use	+	0.423	7.272	0.000

***Value t > 3.310 (p < 0.001), **p value > 2.586 (p < 0.01), *p value > 1.965 (p < 0.05)

Note that resorted to non-parametric technique Bootstrap, a resampling process with replacement, considering 130 cases with 5000 samples, which is suggested for concluding findings (Simar & Wilson, 2000), the above values were obtained using Student t-test and significance (p). For a t distribution, two-tailed with n degrees of freedom, where n is the number of samples to be considered in the Bootstrap technique, values that define the statistical significance are: t (95%) = 1.96* T (99%) = 2.58** t (99.9%) = 3.31***. As seen in Table 7, only the hypothesis H3, not significant.

Finally, the value of the Residual Standardized Root Mean Square was calculated (SRMR), which is interpreted as the average difference between the covariance and observed based on the standard error of the residual; consequently, it can be deliberated as a measure of goodness of fit for PLS-SEM models (Hair et al., 2014). Values must be between 0.0 (perfect fit) and less than 0.08 to be considered as valid (Wong, 2013), in this sense, the value obtained for SRMR research model proposed is 0.069, indicating an adequate level of fit. After obtaining the results of the PLS modeling, proceed to accept the coefficient path and by extension confirm the assumptions made that are significant.

To this end, Fig. 2 shows the results obtained.

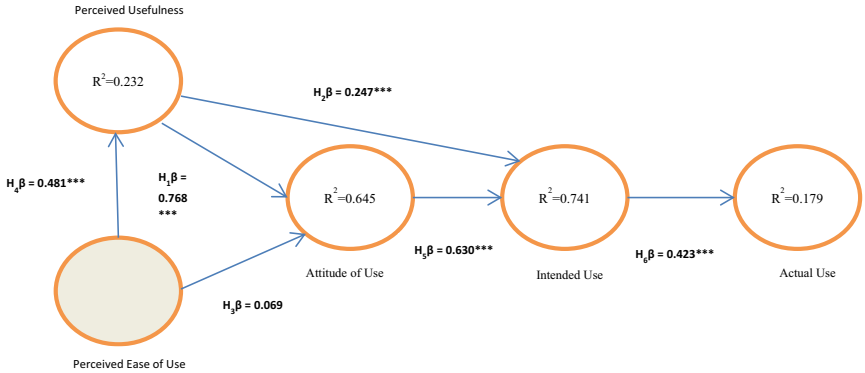

Fig. 2 Coefficients path and statistical significance

4.1 Results Analysis

From Fig. 2, it can be inferred that: the perceived utility of the SMEs regarding the social network Facebook has a positive and significant influence (H_1: $\beta = 0.768***$) in the attitude of use of networks social as a marketing tool having a direct causal relationship, so the H1 hypothesis is accepted, this is comparable to the investigation of Ahmad et al. (2019) in which their results indicate that the *Perceived Usefulness* of users influence their attitude of using e-learning, and also this statement is checked in TRA theory, which states that attitudes toward behavior are influenced by relevant beliefs.

While the relationship between *Perceived Usefulness* and *Intended Use* (Hypothesis H2) is accepted, because the *Perceived Usefulness* of SMEs regarding Facebook has a positive impact on the intended use of social networks as marketing tool ($\beta = 0.247**$), which proves that the easier it is to interact with technology, the greater the satisfaction of the user and therefore shows a greater intention to use (Guesalaga, 2016), also they are related to investigations of Nikou and Economides (2017), Prantl and Mičík (2019) since *Perceived Usefulness* significantly influences the *Intended Use* for the system.

Now, regarding the usability of Facebook and inference in the construct *Attitude of Use*, as shown there is no significant relationship in attitude towards their use in the company (H3: $\beta = 0.069$); therefore, the hypothesis is rejected. The result is very similar to that obtained in the investigation of Lin and Kim (2016) where he also investigated this relationship in the field of social networks, and it was also rejected. This may be due to the fact that most respondents perceived easy handling and personal use; however, at workplace, most activities are directly reflected in their attitude to the use and management of this network.

With regard to the issues raised in the H4, there was a significant effect on the *Ease of Use* on *Perceived Usefulness*; therefore, this hypothesis is accepted demonstrating that the effect of the ease of use of Facebook perceived by SMEs is observed it

is positive in the *Perceived Usefulness* (H4: β = 0.481). In this way, *Ease of Use* contributes to improving the performance of the task, which saves effort, so more and better results with the same effort can be attained (Lin & Kim, 2016).

Moreover, the relationship between *Attitude of Use* and *Intended Use* was accepted (hypothesis H5), as it shows that this construct has an essential influence on the intended use of this social network (β = 0.650***). This demonstrates that the intention is determined by the attitude of the employer using Facebook. This result is consistent with Biswas (2016) who mentions that the attitude towards social networking virtual positively and significantly influences the intention to use them.

Regarding the H6, a causal relationship between the intended use and the current use of Facebook was determined, obtaining a positive and significant effect on end-use level (β = 0.423***); therefore, it shows that the intended use acts as an intermediary between the varying effect exerted by perceptions (usability and perceived utility) and the end-use of the individual, which is similar to that obtained in the investigation of Lane and Coleman (2012) as the results obtained by the authors show a significant positive correlation between aspects of *Intended Use* and *Current Use*, and similarly are related with Guesalaga (2016) because the results of this study support a relationship and positive influence among the variables used as intended and current use.

5 Conclusions and Limitations

Regarding the use of Facebook in business trade and service sector related SMEs in UAE, it has been found that 56% have incorporated this tool to their activities while 44% not used or hardly used, representing nearly half of the sample did not know the use and therefore the benefits of this media. Also, through data processing it has been identified that only 3% of companies carry out strategic planning to carry out marketing activities, representing an alarming fact (Alshurideh et al., 2015a; Alshurideh, 2022; ELSamen & Alshurideh, 2012; Robertson & Kee, 2017).

Another result obtained in relation to the current use of Facebook in SMEs is the time that they invest to make their publications advertising, promotions, sales, and general marketing activities specifically in this social network, denoting that most companies invest little time.

This is also an area of opportunity to incorporate into higher education programs for future business leaders possess this knowledge. On the other hand, regarding the results of utility employers perceive this social network, most are agreed that this tool is useful for your organization and for those companies that have not joined Facebook as its perceived usefulness is high.

As a general conclusion, research and statistical indicators show that the dissemination strategy in social networking is an exceptional tool for the market positioning of SMEs as social networks have generated a significant effect on customers. Especially businesses look to be recognized by them and to maintain sound corporate image of the firm in the eyes of customers. It can be assumed that by employing set

of tactical actions like planning in managing social networking platforms, there can be a positive impact on the positioning of a company in a market.

Furthermore, this paper has some limitations that should be taken in account before simplifying the findings, the first relates to the validity of a model, which cannot be recognized on the base of a single research, since the data signify a snapshot in the time. Second is associated to the geographic area (Dubai and Abu Dhabi); consequently, future studies ought to employ a greater sample and assume a longitudinal tactic and can also comprise and explore the relationships between individual or organizational variables and their impact on the usage of Facebook. Consequently, criticism of the cause-effect perceived must be conducted with cautiousness.

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Digital Marketing Strategies and the Impact on Customer Experience: A Systematic Review

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Abstract The aim of this study is to explore the contemporary digital marketing strategies and tools and the role played by these in various marketing activities or areas. The study also explores the market segmentation in the digital era to improve customer experience tools. In addition, the study determines which strategy has been suggested to be most optimized for enhancing Customer Experience. The research method comprises a Systematic Literature Review (SLR), which included choosing the key publications, data extraction and synthesis, quality assessment for the chosen

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_2

publications, and assessing and presenting the results. This systematic review is important for marketing professionals as it emphasizes the significance of selecting appropriate digital marketing strategies as per marketing activities to maximize customer experience. The results of SLR identify different contemporary marketing strategies such as eWOM, emailing, affiliate marketing, search engine optimization, social media marketing, and corporate blogging. Among these strategies, Social Media Marketing is found to be most effective for the brands in their endeavor to maximize customer experience. It is because of the personalization, customization as well as an interaction which this digital strategy offers to the customers.

Keywords Digital marketing · Strategies · Tools · Customer experience

1 Introduction

The development of digital technology has allowed the emergence of a new environment of social interaction that facilitates and demands, at the same time, a profound transformation of the marketing strategies (Alshurideh et al., 2021; Alzoubi et al., 2021). Digital marketing is currently one of such marketing strategies in which many companies are dedicating greater investment (Lee et al., 2022; Tariq et al., 2022). This new marketing paradigm has been focused, specifically, on the careful management of the relationship between the customers and the company to have information about the customers, their characteristics, needs, and preferences (Edelman, 2010; Alkitbi et al., Alkitbi et al., 2020; Alsharari & Alshurideh, 2020).

Digital marketing is a fundamentally set of approaches, strategies, and tools to promote services and products on online platforms: emails, blogs, social networks, websites, mobile, SEO, etc. (Almaazmi et al., 2020; Nuseir et al., 2021). The achievement of digital marketing initiates with the on-going process of converting leads into loyal customers with a positive customer experience (Cook, 2014). It offers a set of strategies, tools, techniques, and operations coordinated through the Internet to increase the sales of a product or service (Aljumah et al., 2021; Sweiss et al., 2021). As per Parise et al. (2016), digital marketing varies from the conventional marketing manner through the methods and channels. It can be asserted that digital marketing helps to monitor things like conversions, what content works and what does not; how many individuals visit the business web page, collaborate with its social networks, search it in the enormous world of web, etc., and in short can offer the measurement of customer experience in real-time (Al Kurdi & Alshurideh, 2021; Alshurideh et al., 2016).

In the current era, novel technologies and particularly the potential of the Network, have been consolidated as an ideal complement for the establishment of digital marketing activities that include notices on Websites, e-mailing or mass mailings, search marketing, the usage of social networking platforms, and blog marketing among others (Alshurideh et al., 2019; Kurdi et al., 2021). A service or product with an

appropriate digital marketing strategy or tool can generate a positive customer experience (Alshurideh, 2022; Edelman, 2010). Therefore, companies need to establish an adequate digital marketing strategy to generate traffic on the Web, capture potential customers and speed up effective communication with them by providing them with answers or solutions to their needs. In addition, companies need to recognize different types of customers as an essential part of generating a successful customer experience program having strategies that bring about a personalized experience for each segment.

2 Research Objectives

This research aims to explore the contemporary digital marketing strategies and tools and the role played by these in various marketing activities or areas. The study also explores the market segmentation in the digital era to improve customer experience tools. Lastly, the study determines which strategy has been suggested to be most optimized for enhancing Customer Experience.

3 Literature Review

3.1 Customer Experience

The customer experience is defined as perceptions of consumers or users, conscious and subconscious of their relationship with the brand as a result of all interactions during the life cycle of this.

As per Meyer and Schwager (2007), the customer experience is now more than ever relevant for three main reasons. First, the customer experience is playing a critical role in the ability of companies to differentiate themselves from their competitors. Second, the expectations of the customers are changing, many times because of the appearance of new businesses (many of them with a relevant digital component) or new companies in the market that have managed to break "established barriers" (such as WhatsApp, breaking the concept of traditional communication between people). Last, customers no longer expect an incredible customer experience only from large multinationals; they expect it from any company, including small and medium-sized enterprises, since it is not a matter of scale, but to develop the qualities and capabilities required for it (Meyer & Schwager, 2007).

Literature in customer experience management has identified three key levers to offer a superior customer experience: employees, organization, and "detail management" (Verhoef et al., 2009; Alshurideh et al., 2012; Verma et al., 2012; Rawson et al., 2013; Alzoubi et al., 2022). Personal employees are one of the main points to change the customer experience; they are the first line of contact with consumers and should

be skilled and exceed the needs of customers (2020b; Kurdi et al., 2020a; Verhoef et al., 2009). Another aspect is the organization, which means that the customers at the center of all decisions, creating a responsibility at the management team level and making the customer experience a very powerful function within the business (Verma et al., 2012). Last but not least, leaders in customer experience management invest more time in understanding in greater depth the needs of the different segments of clients, or even of individual clients, to be able to offer them more personalized services (Alameeri et al., 2020; Rawson et al., 2013). However, how can a company go from offering a good customer experience to an outstanding one? From the literature point of view, everything is related to offering a personalized experience with a clear brand image and end-to-end vision at any point of contact. For many companies, this can be achieved by implementing digital marketing strategies. In the view of Cook (2014), the ultimate goal of exceeding the client's expectations via digital marketing would attract the client and turn him into a loyal fan of the brand and the product.

3.2 Digital Marketing

Digital marketing uses mobile devices, social media, the internet, search engines, and other mediums to get to customers. Specific marketing experts like Ryan (2016) and Chaffey and Ellis-Chadwick (2019) regard digital marketing as a novel endeavor that necessitates a new method of approaching consumers and comprehending how they behave in contrast to traditional marketing. The implementation of digital tools, together with traditional communication between customers and the company to achieve marketing objectives, is named digital marketing (Chaffey & Ellis-Chadwick, 2019, p. 20). It is an advanced way of advertisement to present the customers with the information materials they require through diverse digital tools. Eventually, traditional marketing and digital marketing have no huge difference in the industry. Nevertheless, the manner of making contacts and delivering info to the customers are more innovative in the latter (Tiago & Veríssimo, 2014).

4 Research Method

The research was carried out in line with the Hair et al. (2008) "*Essentials of marketing research,*" which included tasks such as developing the procedure or review, recognizing and choosing the main publications, data extraction and synthesis, quality assessment for the chosen publications, and assessing and presenting the results.

The researcher used NVivo software to achieve the systematic mapping of the carefully chosen publications. One main advantage of NVivo is that it can distinguish

the same papers spontaneously, lessening the assessors' effort during the selection stage.

4.1 Research Question

RQ1: What are the various marketing activities/areas, and how digital marketing strategies and tools play a role in these activities/areas?
RQ2: What are the contemporary strategies and tools in digital marketing?
RQ3: How Market Segmentation can be achieved in the Digital era to improve Customer Experience?
RQ4: Which digital marketing strategies are most effective in enhancing Customer Experience?

4.2 Search Process

The search process for this SLR began with a systematic search, together with the assessment of references for a number of studies. The digital databases used for the SLR were: ASCE Library, Google Scholar, ScienceDirect, and ASCE Library.

Systematic exploration was carried out on publications' full text and restricted to "Digital Marketing" and "Customer Experience" via the search engine filter. For every database, different keywords and search strings were used for the research questions, and the findings were combined (see Table 1).

4.3 Selection Process

The selection procedure included five stages. The first stage was carrying out a string search on databases and attaining the findings. The second stage was eliminating dual publications via NVivo. The third was investigating the headings and abstracts of studies from each digital database in comparison to the exclusion and inclusion benchmarks and eliminating the irrelevant studies. The fourth stage was revising the whole text of all the chosen studies that remained after the second stage again on the base of inclusion and exclusion benchmarks. The fifth stage was once more looking for the repetition of studies by examining articles having the same authors and including related research areas. In this condition, the up-to-date publications were selected.

The researcher inspected the citations of all main publications remained after the fifth stage to distinguish any other publication not by now included in the designated main studies. After that, these studies had to go through the same selection stage. Figure 1 shows the selection process for the studies and the number of selected

Table 1 Keywords and search strings for searching the studies

Search Strings	Google scholar	ASCE library	ASCE library	Science direct	Total
Digital marketing tools	4	5	1	2	12
Social media marketing + Customer Experience	3	3	2	4	12
Targeting customers in digital era	4	7	4	9	24
Digital customer experience	6	9	6	5	26
Contemporary digital marketing strategies	7	7	2	4	20
Omni-channel marketing strategies + Customer experience	5	3	4	2	14
	29	34	19	26	**108**

studies at each stage. The first stage shows the total publications gotten from each digital database, which was 108 altogether. The circles on the left-side include the number of remaining studies after each stage for the SLR. The circles on the right-side contain the systematic of outstanding studies after each selection stage for the citation search, which was carried out via 10 papers gotten through systematic search. The last sample included 39 studies.

4.4 Exclusion and Inclusion Benchmarks

For the studies to be on a sample, it should be in English and handle digital marketing and customer experience. The researcher intended to include studies that explore contemporary digital marketing approaches to enhance the customer experience even if the authors do not assume clearly that digital marketing is the ultimate way for a positive customer experience. On the other hand, several types of papers and articles were eliminated: papers that do not take into account digital marketing and rather focus on traditional marketing for customer experience; publications that summarize results from prevalent studies like roadmaps, surveys, and reviews; repeated papers and finally, articles that cannot be downloaded from digital databases.

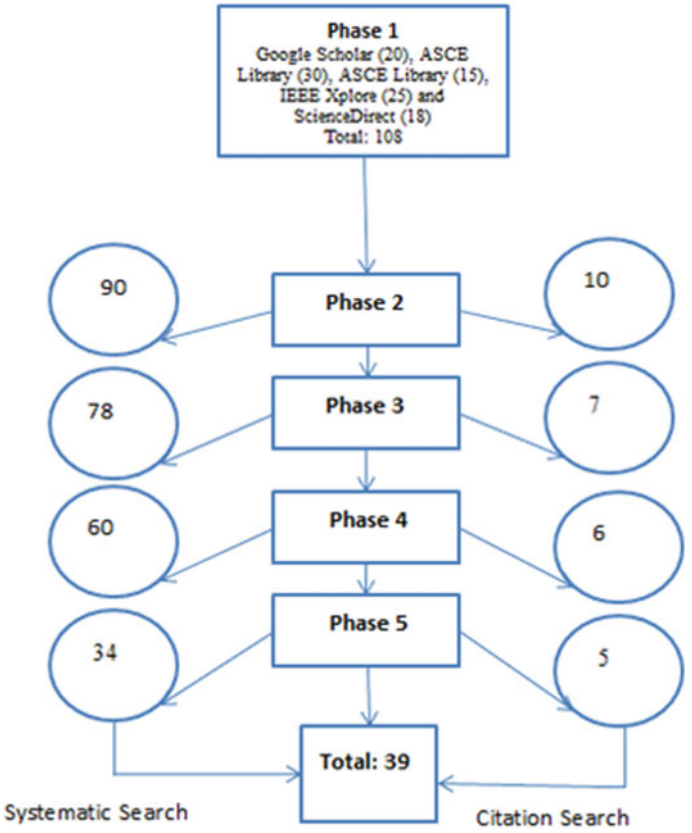

Fig. 1 The selection procedure for the studies and the number of selected studies at each stage

4.5 Quality Evaluation

The quality evaluation is a subjective process as different researchers value different aspects of the research. In this systematic review, the researchers chose the inclusion and exclusion benchmarks for the evaluation of quality. The quality evaluation is based founded on the specified by Hair et al. (2008). Some of the key points were: The aims of the publication are defined in a clear manner (Yes = 1 or No = 0); The publication efficiently describes the matrices (Yes = 1 or No = 0); The data gathering methods are defined well (Yes = 1 or No = 0); The findings are presented in a clear and an unambiguous way (Yes = 1 or No = 0); The findings are supported by empirical evaluation (Yes = 1 or No = 0); The threats to the paper validity are reflected (Yes = 1 or No = 0).

4.6 Data Extraction

The researcher totally inspected all of the 39 publications for getting the crucial information and used a well-defined way to have numerous features for data extraction and storage. A few of the features were a year of publication, source, paper type (conference paper, journal article, book chapter), and quality score.

These features were expected to be indispensable to answer the key research question. This paper did not include the details on the procedure of data extraction because of space restriction. One investigator was tasked with extracting and verifying the data. As most of the selected studies were qualitative, a meta-analytical technique was not suitable for synthesizing data.

5 Results and Discussion

5.1 Overview of the Publications

Table 2 displays authors and year of publication in addition to the types and quality scores for the selected studies. As much as the publication year is concerned, it can be seen that from the Fig. 2 that Digital marketing strategies and tools have been a hot research area in the marketing and management literature during the previous ten years; however, customer experience and traditional marketing strategies can be found in literature during the past five decades. Alternatively, Digital marketing and customer experience is a very contemporary phenomenon. Averagely, 3 published every year. It can be seen from Fig. 2b, around 61% of the publications were journaled articles, while 31% were reported. On the other hand, 11 publications got the maximum score which meant that they defined their objectives, metrics, and data collection methods effectively. When classifying the publications in Table 2, the researcher coded journal articles as 'J,' reports as 'R,' and conference papers as 'C.'

It can also be seen that the researcher restricted the date of publication in the search stage to nine years, i.e., 2010 to 2019. The reason for choosing 2010 was that as this was the year when the most relevant study was published. This shows that there is much room for growth within this area of marketing literature.

For the quality score, the researcher used the aforementioned 6-point criteria (0–1 score) to evaluate the sample. The higher the score, the detailed and clearer the study is to the present SLR. The lowest score acquired by the study comprised in this SLR was 1. Only 2 studies got this score. These publications failed to include any empirical methods efficiently. Most of the publications achieved either a 4 or 5 score, which means that the general sample was strong in nature as the publications backed empirical evidence. This rationalizes the effort to carry out the SLR in this emerging area of marketing.

Table 2 Overview of the publications as per year, quality score, and type

Sr. number	Authors and year	Quality score	Publication type
1	Edelman (2010)	5	J
2	Chaffey (2010)	4	J
3	Peterson et al. (2010)	2	J
4	Munro and Richards (2011)	4.5	J
5	Heller and Parasnis (2011)	6	C
6	Hollebeek (2011)	3	J
7	Gopalani and Shick (2011)	4	C
8	Smith (2012)	6	C
9	Verma et al., (2012)	1	J
10	Hudson et al. (2012)	5	R
11	Mitic and Kapoulas (2012)	5	J
12	Dumitrescu et al.(2012)	4	J
13	Rawson et al. (2013)	5	J
14	Nash et al. (2013)	6	J
15	Tiago et al. (2014)	6	J
16	Cook (2014)	2	J
17	Solis et al., (2014)	5	R
18	Ryan (2014)	5	R
19	Schneider (2014)	6	R
20	Dennis et al. (2014)	3	J
21	Dörner and Edelman (2015)	4	R
22	Edelman and Heller (2015)	6	R
23	Bennett and El Azhari (2015)	6	R
24	Kane et al. (2015)		J
25	Lemon and Verhoef (2016)	6	J
26	Parise et al. (2016)	4	J
27	Ryan (2016)	4	R
28	Jackson and Ahuja (2016)	6	J
29	Bilgihan (2016)	6	R
30	Gill and VanBoskirk (2016)	4	J
31	Payne et al. (2017)	4	J
32	Homburg et al. (2017)	5	J
33	Bolton et al. (2018)	5	J
34	Bughin et al. (2018)	3	R
35	Iankova et al.(2018)	4	R

(continued)

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Table 2 (continued)

Sr. number	Authors and year	Quality score	Publication type
36	Petit et al. (2019)	1	J
37	Goodman (2019)	2	R
38	Chou (2019)	4	J
39	Flavián et al. (2019)	3	J

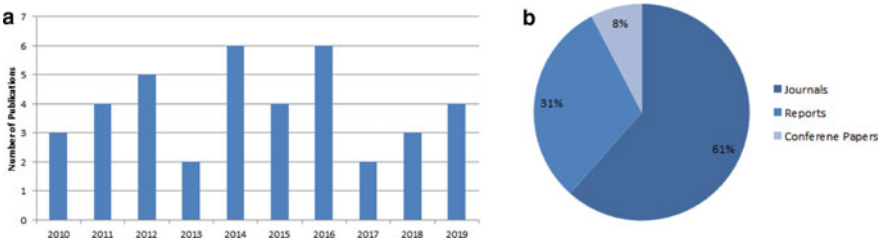

Fig. 2 **a** Number of publications per year; **b** Types of publications

5.2 Marketing Activities and Related Digital Strategies

The systematic review of the sample showed that digital marketing strategies vary as per marketing activities. The researchers identified different marketing activities and related digital marketing strategies presented below.

Market research: In this area, reference is made to all the tools designed to understand better the market in which it competes and the targets in the ones to focus on to obtain leads that can easily become customers. An example of a digital marketing tool in this area is electronic surveys (Edelman, 2010) and online focus groups (Smith, 2012).

Brand: It refers to all actions aimed at improving product or service awareness (brand recognition) among the public of interest. Some of the best electronic tools to improve the top of mind (positioning) and the share of voice (SOV or voice participation) are, for example, corporate blogs and direct search engine marketing (Cook, 2014).

Product: Actions oriented to a product or a line of them. Some of the proposed tools in the publications are digital product verifiers or online product testing (Peterson et al., 2010; Al-Dmour et al., 2021; Al-Khayyal et al., 2021; Khasawneh et al., 2021a).

Price: This area includes the actions related to the price variable for improving the marketing mix. The digital world offers important contributions in this area, such as digital price timing or electronic auctions (e-auctions) (Gill and VanBoskirk, 2016).

Communication: This area and those of promotion and advertising are integrated into the model of the 4P's; however, in practice, it is appropriate to treat the actions separately of communication in which the company does not pay for appearing in a

third-party media (advertising) or encourages the purchase of a direct form (promotion). As stated by Homburg et al. (2017), virtual communities and RSS marketing (Content Syndication Systems) are an explanatory example from the electronic point of view.

Promotion: The point of sale is one of the marketing scenarios in which the digital revolution has been noticed more because it is detached in a way totally from the Internet like the other forms of electronic promotion such as digital coupons or re-merchandising (Al-Dmour et al., 2014; Dennis et al., 2014; Ryan, 2016).

Advertising: Online advertising is commercial and informative information expressed with creativity about a product or service on the network (Alshurideh et al., 2017). As an example, Homburg et al. (2017) cited buzz marketing or contextual advertising.

Distribution: Like, the price and the product, in this area, the correspondence between theory and practice is clear and direct. Examples of tools are infomediaries (Mitic & Kapoulas, 2012) or affiliate marketing (Bolton et al., 2018).

Marketing: Without a doubt, the ultimate goal of marketing is selling, so that in practice, there must be an area that groups together all the tools to make it more profitable and productive, which from the electronic channel they get without going away the marketplaces and the e-commerce portals (Alzoubi et al., 2022; Kane et al., 2015).

Control: It is necessary to measure the effectiveness of digital marketing tools to improve both the selection and how to use it (strategy). The Customer Relationship Management (CRM) which is based on knowing the customer as much as possible and identify to produce what customers want to buy, and the Gross Rating Point (GRP), which corresponds to the metrics par excellence used to measure the impact of spots determining how much of the target the company has reached. The CRM (Heller and Parasnis, 2011) and the electronic GRP (Bolton et al., 2018) constitute excellent audit tools for e-marketing.

The following table summarises the findings for the various marketing activities and related digital marketing strategies and tools.

5.3 Digital Marketing Strategies

5.3.1 Viral Marketing or Buzz Marketing

Viral marketing or buzz marketing is one of the most examined digital strategies in the chosen publications. Also called the electronic word of mouth (eWOM), this strategy encourages individuals to quickly convey a commercial message to others seeking to create exponential growth in the exposure of said message (Edelman, 2010). As per Chaffey (2010), it deals with commercial communication that propagates by itself. It is a tool of communication on the Internet that allows the diffusion of a message, starting from a small emitter core that is multiplied by the collaboration of the receivers in their transmission and diffusion, generating a pyramidal effect

with geometric growth (Nash et al., 2013). With the viral marketing advertising campaigns spread like a virus through the network, and the users are the ones who share and transmit the advertising message, the costs associated with this strategy are considerably low or zero.

Nash et al. (2013) maintained that any eWOM campaign on the network should be feasible to be shared or transmitted from one user to another. The ease that users have to pass a message to others will directly influence the scope and spread of the campaign. So, if a firm publishes a very interesting article, it should allow with just a press of a key to be forwarded to a friend; or if a video is published, it must be ensured that it can be download in a format compatible with most users and that additionally can be easily forwarded to other users; if an image is loaded; that it can be downloaded and forwarded easily; if an application is created; that it can be installed in any operating system or if it is a document then it can be added to the social networks (Edelman, 2010).

5.3.2 Email Marketing

This digital marketing strategy consists in the use of electronic mail as a loyalty strategy; that is, it proposes to attract new customers and retain customers already acquired through the sending of messages to email accounts to maintain a continuous dialogue with the client throughout the entire commercial relationship and finally feed a certain base of data (Peterson et al., 2010; Smith, 2012). The foundation of this strategy is focused on the fact that more than one trillion emails are sent every day. This behavior makes e-mail marketing one of the most effective, fastest tools and to carry out advertising campaigns directly through electronic mail system because it is an ideal means of carrying out any type of one to one marketing action (Smith, 2012).

In the view of Parise et al. (2016), e-mail marketing is a good complement to offline marketing. Some of the benefits highlighted in the studies are interactivity, customization, low intrusiveness, savings, reduction of times and distances; it also avoids inconveniences related to legal and brand risks. Its purpose is to generate a good price to induce the desired purchase.

5.3.3 Affiliate Marketing

This digital marketing strategy refers to online platforms where advertisers are contacted who want to advertise their brand, their products, or their services with Web pages of all kinds and size that are intended to include advertising on the site for economic purposes (Peterson et al., 2010; Cook, 2014; Payne et al., 2017). The advertisers indicate the commission they offer to the media for using their advertising and, according to the commission, use an advertiser. Therefore the affiliate network rents the commission that the advertiser pays to the affiliate. Affiliate marketing is a

form of Internet distribution based on commissions in which one company (advertiser) rewards economically another (publisher) for generating business through a series of links introduced in the website (Payne et al., 2017). These Hyperlinks can be routed to the direct sale of the product or sent to the user who has accessed the website to the selling company's page.

5.3.4 Search Engine Marketing

Search engine optimization consists of applying techniques and strategies to locate preferentially, via keywords or words key, websites in the search engines. The main motivation is that the companies want and need to be well-positioned in the network, which is equivalent to be among the first thirty results offered by different search engines (Munro & Richards, 2011). As per SLR, it is important to be positioned in the network; although "being" in the network means very little, the important thing is "to be visible to the user" (Gopalani & Shick, 2011; Munro & Richards, 2011).

5.3.5 Social Media Marketing (SMM)

The Internet makes it possible to have conversations between individual customers and companies that were simply impossible in the era of traditional media (Almazroue et al., 2020; Khasawneh et al., 2021b). Through Social Media, a company can converse individually with all of its customers in a unique and personalized way because the SMM are tools of communication that allow listening and speaking with the client (Heller and Parasnis, 2011; Rawson et al., 2013; Edelman and Heller, 2015). From a technical approach, SMMs can be described as platforms such as Facebook, Twitter, Instagram, MySpace, YouTube, LinkedIn, and others to publish content where the users make decisions about the published content (Al-Maroof et al., 2021). These users become people influencers whose thematic agenda is subject to personal circumstances and/or professionals of each.

One of the most significant SMM approaches is Facebook marketing (Edelman and Heller, 2015). Facebook, with more than 800 million users, works equivalently to a meeting place between customers or users with similar needs and interests who share, both professionally and personally. So it is considered the most important social network worldwide. From the perspective of marketing, it is especially interesting for products and services aimed at markets having huge consumption potential (Edelman and Heller, 2015). Many companies have their profile on Facebook and constitute one of the best tools when communicating and interacting with customers.

5.3.6 Corporate Blogs

According to Goodman (2019), the term blog corresponds to a Web frequently updated, chronologically structured offering information about one or several topics

in an informal and accessible way, written by one or more authors and where the most recent one appears first and with the author retaining the freedom to publish what he/she thinks relevant. These are weblogs of personal, journalistic, business or corporate, technological, etc. Corporate blogs are published to achieve business objectives such as the positioning of the brand, the firm, and the internal communication where blogs act as a management tool for the knowledge and external communication to strengthen relationships with key groups of clients (Bughin et al., 2018).

5.3.7 Other Tools

Mobile Apps: Mobile applications are essential within an e-marketing strategy. The customer experience is fundamental, and the reputation of the brand is at stake. Some studies such as (Mitic & Kapoulas, 2012) and (Dennis et al., 2014) recommended including mobile applications within a company's mobile marketing strategy and taking advantage of the capabilities of mobile phones, making them simple and useful, integrating them into a marketing strategy of the company, using external Apps, choosing the right platform, including social networks, attracting the client and measuring the result.

Electronic product configurators and verifiers: An online product configurator is a special software that is inserted inside a site and allows the potential buyer to customize their product according to all the options available to them (Lemon & Verhoef, 2016). A product verifier is a system (software + hardware) that focuses on choosing options to show the product from all possible points of view. The navigator has experience as close as possible to that of a "physical test" of the product. Lemon and Verhoef (2016) highlighted that it is especially useful in products such as clothing and increases the customer perception of the brand and promotes trust.

Electronic coupons: e-coupons seek that the buyer prefers a brand, product/store in exchange for a discount on the purchase, a sample, or a free product (Jackson & Ahuja, 2016). The traditional coupon required going to the establishment to benefit from the discount; the new technologies reduced the process by just clicking on the computer or pressing a button on the phone to capture coupons to be exchanged electronically.

e- Survey: This tool facilitates marketing research by evaluating processes to determine the loyalty ratios, level of satisfaction with the purchase and customer service, etc. (Jackson & Ahuja, 2016). This tool also facilitates the client's relationship to ensure that the products, services, and prices satisfy them, know better the tastes, satisfactions and interests, and segment them to make a more personalized offer.

5.4 Market Segmentation in the Digital Era and Customer Experience

To adopt an effective digital marketing strategy in order to create a positive customer experience, it is essential to defines the profiles of the customers and places them in the appropriate segment. In the view of Hollebeek (2011), customer segmentation allows targeting particular groups of customers efficiently. Studies defined different market segments such as Backuppers, Bluetooths, Browsers, Hackers, Trojans, and Virals (Flavián et al., 2019; Iankova et al., 2018; Ryan, 2014; Verma et al., 2012). Examining these segments would also help in understanding how negative customer experience would hamper the company/business.

Backuppers: Corresponds to those satisfied customers who do not pronounce or exercise any kind of influence in the market (Verma et al., 2012). The business achieved through these clients is what they generate personally, i.e., the Medium Business Potential (MPN) or the VEC. These clients allow the company to survive without risk. The MPN is the weighted sum of the client's successful experience and the value that can generate the weighting coefficients depending on the strategic objectives of the company.

Bluetooth: The customers are satisfied enough to boast of their belonging to the company/organization (Ryan, 2014). They exert a positive influence on the market. The business will be the sum of the personal business plus the amount generated by its influence, which corresponds to the Net Positive Influence Index (NPII). The volume of the business that the clients of this segment suppose is: (NPII + 1) x MPN.

Browsers: The customers who, not being satisfied, do not keep the relationship, but they also have no influence on the market, so they do not destroy extra value, but customers lose only the MPN in this segment (Iankova et al., 2018).

Hackers: They are those customers who, in addition to not being satisfied with the products and/or services of the company, not only do not maintain the relationship but rather exert a strong negative influence among potential customers (Flavián et al., 2019) which corresponds to the Net Negative Influence Index (NNII). Therefore, the destruction of value due to this type of client is: (NNII + 1) x MPN.

Trojans: These are those customers that are maintained due to the different obstacles that condition their exit and that the company has established, for example, permanency contracts that under the assumption of loyalty establish some companies with which the user has no other option but to stay and continue paying, but the negative influence they exert on the market due to the mixture of dissatisfaction and frustration is very dangerous for the company (Iankova et al., 2018; Schneider, 2014). It corresponds to a specific destruction segment that can be evaluated with (NNII – 1) x MPN. The value (−1) is maintained during the period of time in which the obstacle for the exit of the client, that is, the time during which he continues to pay the fee for the service rendered.

Virals: These are those customers who are necessary to conquer more and more. If their experience is satisfactory with the acquisition of product/service, they communicate it to others, that is, exert a strong positive influence and attract undecided

Table 3 Digital marketing activities and related digital marketing strategies and tools

Marketing activities	Digital marketing strategies and tools	References
Market research	Electronic surveys; Online Focus Groups	Edelman (2010), Smith (2012)
Brand	Corporate blogs; Search engine marketing; The electronic word of mouth (eWOM)	Cook (2014)
Product	Digital product verifiers or the online product testing	Peterson et al. (2010)
Price	E-Auctions	Gill and VanBoskirk (2016)
Communication	RSS Marketing; Virtual communities	Homburg et al. (2017)
Promotion	Digital coupons or E-Merchandising	Dennis et al. (2014), Ryan (2016)
Advertising	Buzz marketing; Contextual advertising	Homburg et al. (2017)
Distribution	Infomediaries or affiliate marketing	Bolton et al. (2018), Mitic and Kapoulas (2012)
Marketing	E-Commerce portals; Social media, Blogs, Content creation	Kane et al. (2015)
Control	CRM and the electronic GRP	Heller and Parasnis (2011), Bolton et al. (2018)

customers or others who had not even considered it; therefore, the volume of business that they contribute, is the derivative of their influence, constituting a new continuity (Bilgihan, 2016; Flavián et al., 2019). Its evaluation corresponds to the expression: (NPII – 1) x MPN.

The following Table 3 shows that summary for the different market segments and indexes to measure customer experience (Heller and Parasnis, 2011; Rawson et al., 2013; Edelman and Heller, 2015) (Table 4).

6 Discussion

In contemporary years, it has become clear that all effective marketing strategies intended to improve the customer experience. Their voices are the ones that establish brands, form the market, and directly affect sales, so it appears rational that marketing determinations must work towards enhancing their experience (Tiago et al., 2014).

The SLR presented several strategies and tools which can enhance customer experience and generate a positive perception of the brand. One of the most important strategies is the eWOM campaign, which, as per the scholars, can effectively maximize customer experience (Kane et al., 2015; Ryan, 2016). This tool does not require

Table 4 Different market segments and indexes to measure customer experience

Different market segments	Indexes to measure customer experience	References
Backuppers	MPN	Verma et al. (2012)
Bluetooths	(NPII + 1) x MPN	Ryan (2014)
Browsers	-MPN	Iankova et al. (2018)
Hackers	(NNII + 1) x MPN	Flavián et al. (2019)
Trojans	(NNII – 1) x MPN	Iankova et al. (2018), Schneider (2014)
Virals	(NNII + 1) x MPN	Bilgihan (2016), Flavián et al. (2019)

much effort since the action of the users themselves transmits the message; the key is to find the key attraction that drives the multiplier diffusion. Likewise, it offers a quick brand promotion, a small investment volume, a very high response rate, and generates pre-existing social networks offering great efficiency and interactivity. However, Gill and VanBoskirk (2016) argued that customer experience could be affected badly if the loss of the message occurred or the interruption of the file by the antivirus preventing the reception of the message or the distortion of the message by the receiving audience; thus, creating a negative customer experience.

Likewise, the SLR highlighted e-mailing as the most powerful and effective e-marketing channel with the potential to maximize customer experience. In the view of Bilgihan (2016), the perception and experience of a customer concerning a certain product improve when the advertising message is personal and interactive. E-mailing, being a multidirectional channel, allows knowing the clients' opinions and allows real-time tracking of the action's effectiveness (Hudson et al., 2012). Likewise, the recipient of any communication via e-mail must have authorized and consented to send messages (permission marketing), what otherwise constitutes reportable illegality in several countries like the US and Spain. In addition, Homburg et al. (2017) maintained that to maximize customer experience. An e-mail must be short, no more than 30 or 40 characters, or a maximum of seven or eight words and include words such as "offer," "gift," "urgent," or questions that generate interest of the customers (Nash et al., 2013). Customization is the key when maximizing customer experience via e-mail marketing. However, similar to eWOM, email marketing can create a negative customer experience if messages are sent with false and misleading content. Customers can also become a Spam victim, which would also damage the customer experience (Hudson et al., 2012).

Another strategy is affiliate marketing, which aims to transform the customers into affiliates. Affiliation agreements between advertisers and sellers are operationalized through the so-called affiliate programs to which you can Access by click and by sale (Chou, 2019). Affiliate marketing can do a lot to construct trust, particularly when the affiliate has an enormous following. Instead of asking consumers to

take the company's word for the quality of its goods and services, it asks someone else to do this for it while growing the experience and reach of the brand. Bolton et al. (2018) argued that the usage of referral programs enhances the impact of affiliate programs on customer experience. DropBox, Netflix, Uber are all incredibly successful examples of how "refer a friend" can boom a business. Some companies like Dell incorporate affiliate marketing with Electronic product configurators, a very complex tool from the technological point of view. A classic example of this type of tool is Dell computers' brand that allows customers to configure computers that they buy according to their online preferences without limiting those already configured with fixed characteristics (Bolton et al., 2018).

Furthermore, search engine marketing or SEO aims to create a positive customer experience by showing the customers the products on the first page of the engine. Studies show that users do not usually go beyond the third page of results. To achieve, it is necessary to optimize the Web page, that is, adapt it so that seekers understand it better and value it more (Dumitrescu et al., 2012). This is the most economical way to position the company on the Internet. The first thing for a positive customer experience is to choose the keywords for the activity to be published. Petit et al. (2019) maintained that it is necessary to perform comparative analyses with the competition through dashboards that allow companies to monitor certain words or combinations of words.

As mentioned, for the generation of positive customer experience, personalization, and customization, as well as interaction, are fundamental aspects of the digital era. Marketing via social media offers the customers the ease of access, participation, personalization to the user's taste and conversation, among others (Nash et al., 2013). The most striking feature of Social Media is the viral capacity that its contents acquire and from a business point of view. This relevance can occur between activities such as purchase, consumption or capture of attention. Numerous social networks aim to enhance the customer experience in a different approach and are suggested by several authors. The following table shows the types of these networks (Table 5).

As far as corporate blogging is concerned, similar to SMM, it tends to create decentralized information engaging the customers on a large scale (Tiago et al., 2014). Some of the studies regarded blogs as one of the most effective approaches to enhance the customer experience owing to faithfulness, loyalty, and trust among the customers. Faithfulness is based on the relationship of trust that is established with the blog editor, hence the importance of respecting their principles, and although they may become corporate vehicles or commercial the rules have to be maintained. Studies such as (Dörner & Edelman, 2015; Solis et al., 2014) argued that similar to e-mailing, if used properly, a blog allows the company's positioning as an organization of experts least in one suitable place. Because of its social environment, blogs allow the customers to participate publicly, free, and in real-time. Any reader can know the opinion of all the participants, which is a great advantage over the traditional written press. This is one of the characteristics that has made blogs the main drivers of the Web 2.0 phenomenon. However, they entail the danger that certain comments made without foundation affect the image and the positioning of some company, a risk it shares with viral/buzz marketing or eWOM (Petit et al., 2019).

Table 5 Types of social networks and respective approach to enhance customer experience

Types of social networks	Approach to enhance customer experience	Examples	References
Content, social networks	Builds relationships by joining profiles through published content; files, and documents shared	Scribd, Flickr, Bebo, Friendster, Dipity, StumbleUpon, and FileRide	Heller and Parasnis (2011)
Social networks of inert objects	Unites brands and places; make up a novel sector between social networks	Respectance	Nash et al. (2013), Rawson et al. (2013)
Sedentary social networks	By creating flexible and dynamic relations between people, the shared contents or the events created	Rejaw, Blogger, Kwippy, Plaxo, Bitacoras.com, Plurk	Edelman and Heller (2015)
Nomadic social networks	networks are composed and recomposed to the tenor of the subjects who are geographically close to the place where they find the user	Foursquare, Gowalla, Latitude, Brightkite, Fire Eagle, and Skout	Bolton et al. (2018)
Social Web Network	Based on a typical structure of Web and enhances customer experience via eWOM	Facebook, Twitter, Instagram, MySpace, YouTube, LinkedIn	Bolton et al. (2018)

7 Threats to Internal and External Validity

For the SLR findings, the key threats can be those associated with external and construct validity and reliability. This is because the chosen research method, i.e., SLR, mainly focused on the selection and categorization of previous studies.

The threat to external validity is when the competence to generalize the publication's findings is restricted (Klink & Smith, 2001). For the present study, a likely threat would be whether the chosen publications characterize a substantial portion of the past studies on current digital marketing strategies and customer experience. The researcher intended to reduce this threat by employing four online databases for the systematic search and employing the citation research method. Still, the researcher overlooked several digital databases and did not carry out manual research. Consequently, there are likely a few papers that could not be retrieved from the libraries and were not referred to by any of the publications carefully chosen.

Construct validity is the extent to which a test measures what it purports or claims to be measuring (Heale & Twycross, 2015). In the present study, the key threat was

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whether the search strings reflected the original intentions. The researcher aimed to reduce this threat by authenticating the strings from a marketing professional. When validating the strings, the researcher confirmed if publications were incorporated in the sample.

Reliability is related to what degree the data and the analysis are reliant on the particular researchers (Heale & Twycross, 2015). In the present study, the extraction of data was achieved by three experts within the field of marketing. Thus, this threat was minimized by selecting the maximum number of researchers for the task.

8 Conclusion

In the digital era, customer experience becomes positive if the information reached in the first instant is distributive, horizontal, and backed by many references such as peers and colleagues. This can be achieved most effectively via social media marketing, especially Facebook marketing. Digital marketing strategies such as social media marketing allows the development of products of the client's preference since the social networking platforms like Facebook and Twitter facilitate research in a more personalized way in order to develop products that necessarily enhance the customer experience. In addition, using social media does not generate high costs.

The customers who connect to social networks do so because they are interested in the information that is published by the contact list; while generating content that their friends follow, becoming a platform that allows society to access information valid outside the traditional media. When the customer experience is positive, these users become social media influencers, thus improving brand sales and productivity.

At present, social networks have consolidated as platforms oriented to the business world, and without having an active presence in it is practically impossible to achieve online reputation and image. Even corporate bogging can be done via social media platforms, and debates and discussions can be carried out on any subject in an agile way. The best way to increase the customer experience is to complement social media marketing strategy with tools such as electronic product configurators and verifiers or e-coupons. This would enhance customer perception of the brand.

Overall, this review is important for marketing professionals as it emphasizes the significance of selecting appropriate digital marketing strategies as per marketing activities to maximize customer experience. The Internet is the most powerful tool for businesses. Marketing managers who fail to utilize the Internet's importance in their business marketing strategy will be disadvantaged because the Internet is changing the brand, pricing, distribution, and promotion strategy. Future research should focus on selecting a particular industry or organization to conduct a qualitative or quantitative study to determine the effectiveness of social media marketing strategy.

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Effects of Social Media Marketing on Consumer Perception in Liverpool, UK

Mohammed T. Nuseir, Ahmad Aljumah, Sarah Urabi, Barween Al Kurdi, and Muhammad Alshurideh

Abstract The purpose of this research is to analyze the effects of social media marketing on consumer perception for the people in Liverpool, UK. The descriptive research approach is used for this research. The research collected quantitative data and smart PLS analysis is done to analyze those collected data. It is found out from this research that the effect of social media marketing on consumer perception is positive and is increasing day by day because of the increasing use of the internet. The main limitation of this research was that the researcher was only able to work on the people of Liverpool. If the researcher would get more time and more financial support, the research could be done with vast information collected from a bigger sample size from other areas in the UK too. This research will help the companies to understand the power of social media platforms towards increasing consumer

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_3

perception and it will also show them the ways to properly use the social media platforms to retain current customers and get new customers.

Keywords Consumer perception · Social media marketing · Promotional marketing · Door to door marketing · Buying decision · Social media · Trust · Brand value · Smart-PLS analysis · Marketing tool

1 Introduction

Digital marketing or online marketing has helped to open a new era in the marketing field with different ways of marketing. Social media is one of the most powerful marketing tools used by organizations nowadays (Al Kurdi et al., 1339; Aljumah et al., 2021a; Almazrouei et al., 1261). Sajid (2016) Stated that easy access to the internet and social media by the people helps the organizations to deliver their unique marketing message towards their target customers. Social media helps the organizations to increase sales, share business information and also provide social support towards their customers (Al Khasawneh et al., 2021a, 2021b; Al-Maroof et al., 2021). Aljumah et al. (2021b), Sajid (2016) added that from the year 2004, the popularity of using social media as a marketing tool has increased as it delivers information about the products towards the users (Ahmad et al., 2021; Al Kurdi & Alshurideh, 2021; Nuseir et al., 2021a). Social media helps the organizations to contact their target customers without facing any local boundaries. This research is done based on the consumers located in Liverpool, UK.

1.1 Problem Statement

In the past few years, social media marketing has become a new marketing tool for organizations. As per the opinion of Stephen (2016), Nuseir et al. (2021b), Al-Dmour et al. (2021), Alshurideh (2022), the main aim of every organization to fulfill the desires of their customers and to make the highest profits through using the most effective marketing strategy as it helps to decrease the production cost. Different organizations use different social media as their marketing tool including Facebook, Twitter, Linkedin and many more. Nowadays, people have easy access to the internet in their smart mobile phones. Sajid (2016) stated that the firms use this rapid growth of using the internet as they now start using the internet as their marketing tool to affect consumer perception through social media marketing.

1.2 Purpose

The main purpose of this research is to understand the effects of social media marketing on consumer perception (Abuhashesh et al., 2021). In the recent past, easy access to the internet and social media has increased rapidly and people access social media sites regularly. The perception of people has changed by social media. Door to door selling was the most popular marketing strategy of the organizations before this social media era. However, now social media is helping the firms towards increasing their sales and making maximum profits (Al Dmour et al., 2014; Alshurideh et al., 2021; Suleman et al., 2021). Social media gave people many buying choices. People are now well known to many different brands due to the advertisements spread by organizations through social media sites. So, it can be said that social media has greater effects on consumer perception compared to another marketing tool.

1.3 Research Objective

The objectives of the research are–

- To understand the impacts of social media marketing on consumer perception.
- To assess the effects of the door to door marketing on consumer perception.
- To evaluate the roles of social media marketing as a promising marketing tool.

1.4 Research Questions

The research questions for this research are–

- What are the impacts of social media marketing on consumer perception?
- What are the effects of the door to door marketing on consumer perception?
- What are the roles of social media marketing as a promising marketing tool?

2 Conceptual Framework and Hypotheses Development

This section will elaborate on the existing theories about this topic. Research hypotheses will also be developed in this section.

2.1 Social Media Marketing

Social media marketing has become a very popular marketing tool for most of the organizations of all sizes as it helps them to reach their target customers. As per the opinion of Sajid (2016), effective marketing through social media may help the organizations to achieve remarkable business success through creating brand awareness among the customers. It also helps in maximizing sales of the organizations. Aissani and Awad ElRefae (2021), Zhu and Chen (2015) stated that social media marketing is a type of internet marketing that helps organizations to create and share business content in social media sites such as Facebook, Twitter, Pinterest, Instagram etc. towards achieving marketing goals. The social media marketing contents may include image updates, videos, text posting etc. It also includes paid social media advertising.

According to Stephen (2016), search marketers and social media are very closely related to each other. People often do searches on social media sites towards finding their desire social media content and discover new content. This discovery is considered a search activity. Zhu and Chen (2015) added that social media marketing is growing fast even faster than the internet. However, before creating social media marketing campaigning, one organization should understand their business goals clearly. There should be a proper social strategy that will help the organizations towards achieving their business goal through social media sites. Sajid (2016) stated that social media marketing helps the organization by creating conversations with its target customers, rising website traffic, increasing brand awareness, generating improved communication with their main audiences, and finally creating brand identity towards their target customers. Proper planning is necessary for any organization before starting marketing campaigns through social media sites.

2.2 Promotional Marketing

Chong et al. (2017) informed that promotional marketing helps the organizations to offer any special offers on their products such as special discounts, coupons, incentives, etc. towards attracting their target customers to make an immediate purchasing decision or future purchasing decision through making brand interaction. Promotion is more effective in changing the immediate purchasing behavior of the customers (Al-Dmour & Al-Shraideh, 2008; Al-Dmour et al., 2014; Alshurideh et al., 2017, 2018). Elsaadani (2020), West and McAllister (2013) opined that promotion marketing is often misused when it is handled with inexperienced people. The marketing people of any organization should keep it in mind that they should create positive brand awareness through promotional marketing and it should follow the rules of the internet protocol (Abu Zayyad et al., 2021; Alshurideh et al., 2015; Hamadneh et al., 2021; Sweiss et al., 2021). Hettche et al. (2017) added that promotional marketing could be used by organizations both in online and offline ways. One

of the effective ways to draw the customers' attention is sweepstakes because people love to win prizes.

As per the opinion of West and McAllister (2013), promotional marketing is performed by many organizations, but it targets only the particular targeted customers of a particular organization. Most of the common people cannot know about the promotional marketing campaigns performed by multinational companies as their target audiences are highly profiled people (Al-Duhaish et al., 2014; Alshurideh & Shaltoni, 2014; Alshurideh et al., 2016). Chong et al. (2017) noted that promotional marketing activity towards the target customers is the best possible way for the organizations as it ensures a high positive return on their investments.

2.3 Door to Door Marketing

Door to door marketing has become a history now. The new generation of people who did not even hear of this kind of marketing has ever existed. On the contrary, Fergurson and Fergurson (2017) opined that door to door marketing was the best method of direct selling to the target customers as in this marketing, the salesperson makes direct real human contact with the customers. Nowadays, mostly marketing is performed through the internet or television or FM channels on the radio, where the organization cannot make direct human contact with their target customers. Fergurson and Fergurson (2017) contradicted that nowadays, the crime rate has increased so much that it has become natural that the prospects do not want to give entry to an unknown person to their house.

Fergurson and Fergurson (2017) informed that door to door marketing was a tough job as most of the housekeepers generally say a big NO to the salesperson when they knock the door. Direct marketing like a door to door marketing was an attractive selling method that an organization could use towards achieving the business deal at any position. Fergurson and Fergurson (2017) stated that direct marketing like a door to door marketing is the best way for the organization to achieve their marketing goals by using the information gathered from the customers. Door to door marketing is based on the good communication skills of the salesperson to attract the target customers.

2.4 Consumer Perception

According to Bilgihan et al. (2016), consumer perception is a concept of marketing that helps to understand the awareness, impressions, and consciousness of the customers about the organization and its products. Any organization can influence the perception of their target customers through reviews, advertising, personal experiences, social media, public relations and other methods (Alaali et al., 2021; Alshurideh & Xiao, 2012; Alzoubi et al., 2020; Madi Odeh et al., 2021). Hettche et al.

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(2017) added that everything might affect the perception of the consumers including the position of the product in the store, its shape, colors etc. Sometimes, consumer perception cannot be controlled by the organization such as the time and place when the consumer is making interaction with their desired products as it also affects their perception (Alhamad et al., 2021; Al-Hamad et al., 2021; Joghee et al., 2021; Shah et al., 2021).

Vidal et al. (2016) stated that as perception theory, perception shows the moment when the customers become aware of some particular products through their senses. Every organization should use this theory of perception if they want to attract their customers. The viewpoint of the organization towards attracting customers from different income classes should be different. Bilgihan et al.(2016) added that in case of attracting high-end customers, the organizations should take care of quality, hygiene, packaging, lighting, cleanliness etc. in presenting their products or services. Customer segmentation should be done into different groups as these groups will help the organizations to understand the important things for each group of customers. Hettche et al. (2017) observed that it is important for the organizations to make their customers feel as if they are part of the organization as it will help to increase customer loyalty towards a brand.

2.5 Research Hypothesis

H1: Social media marketing has major effects on consumer perception.
H2: Social media marketing positively affects promotional marketing.
H3: Promotional marketing has positive effects on consumer perception.
H4: Door to door marketing has positive effects on consumer perception.

2.6 Conceptual Framework

Figure 1 is showing the research model followed by the conceptual framework.

3 Instrument Development and Data Collection

Instrument Development: This research is performed based on the quantitative questionnaire. 5-point Likert Scale is used by the researcher from 1 = Strongly Disagree to 5 = Strongly Agree. The questionnaire is formed from previous similar researches as it helped the researcher to enhance research validity. Customer perception is the most important construct for this research. This research helped to understand the impacts of marketing through social media on consumer perception. Other constructs

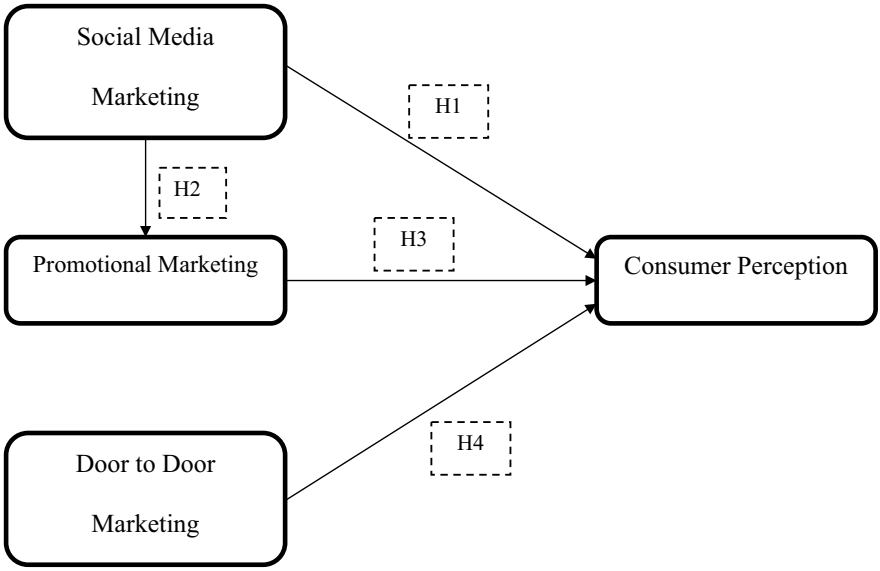

Fig. 1 Research model

for this research are promotional marketing and door to door marketing. The dependent variable for this research is social media marketing, which is another construct for this research.

Data Collection: The quantitative questionnaire is formed and distributed by the researcher among the people of Liverpool, UK. The researcher distributed an online questionnaire to the chosen group of people who are mostly involved in social media marketing. 75 emails with the questionnaire are sent by the researcher to 75 different people. Among them, 55 responses are received by the researcher after three weeks.

Research Method: Structural Equation Modelling (SEM) is a popular research method used by the researcher towards performing this research. Partial Least Square (PLS) method is also used in this research. As per the opinion of Alshurideh et al. (2019a), it is important to use the PLS method as it helps to understand the complex data within any low-structured situation. PLS method is very much helpful where it is hard to gather theoretical information such as the social media area. Ringle and Sarstedt (2016) added that the researcher could assess the reliability and validity of the research through the PLS method. A re-sampling method is also used by the researcher to perform significance testing.

4 Results

The researcher has collected all the needed data by making and distributing a quantitative questionnaire. At first, the researcher set up a quantitative questionnaire and then emails that questionnaire to the selected group of people in Liverpool, UK. These people are chosen based on their involvement in social media marketing. All the people contacted by the researcher did not get back as some of them did not reply or some of them filled up the questionnaire partially. Among 75 emails, only 55 emails could be taken by the researcher as valid responses. The entire data collection process took approximately three weeks. This section will explain the validity and reliability of the structural model for this particular research.

4.1 Reliability

The composite reliability can be understood from Cronbach's Alpha. Bonett and Wright noted that composite reliability is proven when the value of Cronbach's Alpha is more than 0.7. So, the reliability of any research survey can be tested with the help of the value of Cronbach's Alpha. The internal consistency of any research can also be computed by the value of Cronbach's Alpha. From Table 1, it is seen that all the values of Cronbach's Alpha for this particular research are more than 0.7. So, it can be said from those values that the reliability of this research is accepted. The quality criteria overview is seen from the below table.

4.2 Validity

As per the opinion of Heale and Twycross, Construct Validity and Content Validity help to test the validity for any research. The constructs for this particular research are social media marketing, promotional marketing, and door to door marketing. The researcher got help in the information system from these constructs.

On the other hand, face validity is tested by the researcher with the help of this research within the content validity. To perform the validity, the researcher prepared

Table 1 Quality criteria overview

	AVE	Composite reliability	R square	Cronbach's alpha
Social media marketing	0.668342	0.785658		0.775421
Promotional marketing	0.676823	0.89612	0.398744	0.793576
Door to door marketing	0.601308	0.737575		0.731564
Consumer perception	0.697112	0.726885	0.373425	0.735442

the quantitative questionnaire and sent them through emails to the chosen group of people in Liverpool, the UK, who are often involved in social media marketing. The substantial literature review is taken seriously by the researcher. Previous researches done on similar research topics has helped the researcher in setting up quantitative questionnaires. The researcher came up with the research content from the information gathered through these quantitative questionnaires. Egan et al. stated that the assessment of convergent and discriminant validity confirms convergent validity. The full form of AVE is the Average Variance Extracted. Ab Hamid et al. observed that AVE acts as a standard. AVE helps to analyze and calculate the convergent validity. Table 1 shows that the value of AVE for all the constructs is more than 0.5 which is anticipated. Again, the value of composite reliability should always be more than 0.7 and it should also be more than the value of AVE. Table 1 shows that both of these criteria are fulfilled for this research. So, it can be said that the validity of this research is accepted.

The testing of divergent validity can be performed in Tables 2 and 3 presented below.

The value of AVE should be more than the value of MSV (Maximum Shared Squared Variance), the value of ASV (Average Shared Squared Variance), and divergent validity.

AVE > MSV.
AVE > ASV.

Table 2 shows that–

0.817522 > {0.647913, 0.533122, 0.456482} and
0.822693 > {0.647913, 0.594372, 0.440076} and
0.775441 > {0.533122, 0.594372, 0.474514} and
0.834932 > {0.456482, 0.440076, 0.474514}.

Alarcón et al. noted that a researcher should assess the discrimination validity towards comparing the square of correlations of different variables with the value of AVE. Table 2 helps to verify the discrimination validity. A two-fold result can be

Table 2 Square of correlation between latent variables

	Social media marketing	Promotional marketing	Door to door marketing	Consumer perception
Social media marketing	0.817522			
Promotional marketing	0.647913	0.822693		
Door to door marketing	0.533122	0.594372	0.775441	
Consumer perception	0.456482	0.440076	0.474514	0.834932

Table 3 Cross loadings

	Social media marketing	Promotional marketing	Door to door marketing	Consumer perception
SMM1	0.630231	0.324166	0.165503	0.180532
SMM2	0.490231	0.298766	0.421044	0.297703
SMM3	0.49089	0.157767	0.232201	0.334209
SMM4	0.468091	0.195321	0.365054	0.234033
SMM5	0.732654	0.636022	0.450998	0.432011
PM1	0.665099	0.790332	0.609865	0.464401
PM2	0.415527	0.870489	0.632088	0.376608
DTDM1	0.304431	0.376655	0.790234	0.415433
DTDM2	0.56086	0.654409	0.75123	0.412229
CP1	0.430445	0.315033	0.322091	0.763421
CP2	0.397551	0.460224	0.36711	0.845712
CP3	0.198606	0.242331	0.36698	0.64322

Note SMM = Social Media Marketing; PM = Promotional Marketing; DTDM = Door to Door Marketing; CP = Consumer Perception

achieved for convergent and discrimination validity by testing the factor loadings for all the indicators. Ab Hamid et al. informed that the factor loading for every indicator should always be more compared to its constructs based on the value of the other factors.

Table 3 shows the factor loadings of every indicator that are more than the value of their constructs compared to other factors. This condition only can verify the divergent validity of this research.

For SMM 1, 0.630231 > {0.324166, 0.165503, 0.180532} and
For SMM 2, 0.490231 > {0.298766, 0.421044, 0.297703} and
For SMM 3, 0.49089 > {0.157767, 0.232201, 0.334209} and
For SMM 4, 0.468091 > {0.195321, 0.365054, 0.234033} and
For SMM 5, 0.732654 > {0.636022, 0.450998, 0.432011} and
For PM 1, 0.790332 > {0.665099, 0.609865, 0.464401} and
For PM 2, 0.870489 > {0.415527, 0.632088, 0.376608} and
For DTDM 1, 0.790234 > {0.304431, 0.376655, 0.415433} and
For DTDM 2, 0.75123 > {0.56086, 0.654409, 0.412229} and
For CP1, 0.763421 > {0.430445, 0.315033, 0.322091} and
For CP 2, 0.845712 > {0.397551, 0.460224, 0.36711} and
For CP 3, 0.64322 > {0.198606, 0.242331, 0.36698}.

Validity of this research is accepted that is confirmed from Table 3. Table 2 and 3 both helps to prove that the divergent validity for this research is also in acceptable level.

The test of total effects is seen from Tables 4, 5 and 6. Lakens noted that T-statistics should be greater than |1.96| if all the effects need to be accepted.

T-statistics = |Original Sample/Standard Error|

From Table 4, it can be said that the values of all T-statistics are more than |1.96| for this research, and that verifies that all the effects for this research are accepted.

O'Rourke and MacKinnon (2015) informed that the R^2 values for all three constructs for the research should be 0.6, 0.33, or 0.19 which are comparatively judged as substantial, moderate and weak.

Table 4 Test of total effects

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	Standard Error (STERR)	T Statistics (|O/STERR|)
Social media marketing − > Consumer perception	0.343254	0.321333	0.171163	0.171163	2.934220
Social media marketing − > Promotional marketing	0.607754	0.664334	0.055374	0.055374	12.71043
Promotional marketing − > Consumer perception	0.113177	0.129901	0.17566	0.17566	5.323210
Door to door marketing − > Consumer perception	0.255654	0.287601	0.179099	0.179099	4.765655

Table 5 Test of total effects

	R square
Social media marketing	
Promotional marketing	0.398744
Door to door marketing	
Consumer perception	0.373425

Table 6 Test of total effects

Total	SSO	SSE	1-SSE/SSO
Consumer perception	1284	1012.784132	0.211227
Promotional marketing	856	551.221037	0.355926

Table 7 Test of Goodness of Fit (GOF)

	Communality
Social media marketing	0.668342
Promotional marketing	0.676823
Door to door marketing	0.601308
Consumer perception	0.667112

$$R^2 \begin{cases} 0.19 \text{ Weak} \\ 0.33 \text{ Moderate} \\ 0.67 \text{ Substantial} \end{cases}$$

$$Q^2 = 1 - \text{SSE}/\text{SSO}$$

$$Q^2 = \begin{cases} 0.02 \text{ Weak} \\ 0.15 \text{ Moderate} \\ 0.35 \text{ Substantial} \end{cases}$$

It is seen that the R^2 values for promotional marketing and consumer perception are moderate, where the R^2 value for the door to door marketing is weak. On the other hand, all the value of Q^2 for consumer perception is moderate and for promotional marketing, it is substantial (Table 7).

$$\text{GOF} \begin{cases} 0.01 \text{ Weak} \\ 0.25 \text{ Moderate} \\ 0.36 \text{ Substantial} \end{cases}$$

$$\begin{aligned} \text{GOF} &= \sqrt{\left[\{\text{Average } (R^2) \times \text{ Average (Community)}\}\right]} \\ &= \sqrt{[0.39 \times 0.65]} \\ &= 0.5035 > 0.36 \end{aligned}$$

So, GOF is also in acceptance level for this research.

4.3 Structural Model

Smart PLS analysis software is used for this research as it helps to assess the validity of the research through structural paths. The path coefficients for this research need to be at 0.05.

Figure 2 shows that the R^2 value of promotional marketing is approximately 0.42% of the variance of promotional marketing, and it is accounted for social media

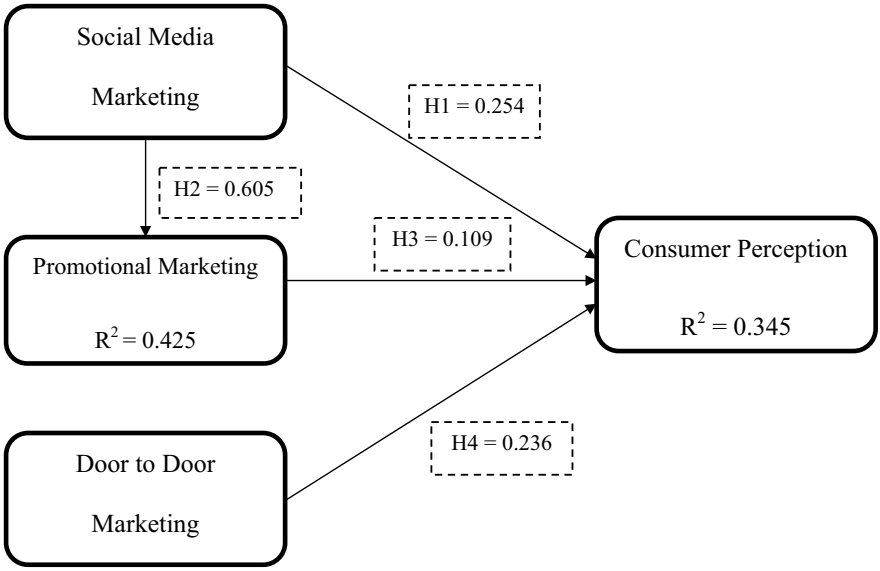

Fig. 2 Smart PLS analysis

marketing. Again, the R^2 value of consumer perception is approximately 0.34% of the variance of consumer perception and also accounted for social media marketing, promotional marketing and door to door marketing. From this PLS analysis, it can be said that consumer perception is, directly and indirectly, dependent upon social media marketing more than door to door marketing.

5 Recommendations and Implications

Customer perception is all about the opinion of the Customers about the products or businesses. It shows the feelings of the customers of any specific brand. It includes the direct and indirect experience of the customers with the product or the company. The company can monitor and analyze this customer perception to understand its drawbacks and improve its relationships with its customers. Customer perception helps the organization to retain their current customers and also increase the number of new customers. Customer perception helps to build a link between the interest of the customers and their actual purchase. This research shows various marketing tools that affect consumer perception. In today's world, both door to door marketing, and social media marketing positively affect customer perception through the effect of social media marketing is little more than door to door marketing. On the other hand, promotional marketing hugely affected by social media marketing and it also positively affect consumer perception. The result from this research is showing that

the power of social media marketing is increasing day by day as the huge usage of internet connection and people are now more engaged in social media platforms. In social media platforms, other people's reviews are very important for the customers while making a final buying decision. Social media also helps in increasing the brand awareness among the customers. There are recommendations for any organization to improve consumer perception through social media platforms.

- *Trust Building*—Every organization should try to build trust among their target customers about its products (Alketbi et al., 2020; Al-khayyal et al., 2020; Al-dweeri et al., 2017). It will help them to make their relationship with their customers stronger (Alshurideh et al., 2019b; Al-Dhuhouri et al., 2021; Alshamsi et al., 1261). People can always see and monitor what a brand is thinking or saying about its products through social media. The organization needs to be transparent to their customers by letting them know that the company is hiding anything from them (2020b; Al Kurdi et al., 2020a; Alshurideh et al., 2020). When something goes wrong, the organization needs to let its customers know about the causes behind it and how sorry they are about this incident. The organization should make promises to their customers and should try to keep them. It will help them to earn the trust of their customers.
- *Showing Brand Values*—Generating brand values is very important for any organization as it helps them to successfully and effectively communicate through social media platforms. It is seen that most of the companies skip this step. However, the companies need to inform their stakeholders through social media platforms how they are related to the values created by their brands.
- *Showing interest in customer*—Through social media platforms, the organization can inform the customers about what they are thinking and regularly doing. The organization should spend more time building strong relations with the customers by responding to their queries and comments about the products. It will help the customers to think that someone cares about them and they will also feel interested in knowing more about the organization and their products.
- *Promoting product images and videos*—Sharing more images and videos about the product helps to generate more audience. Videos in social media help to generate interaction among the customers and the organization. The visual effect creates a clear image of the product and its usages in the minds of the customers. It helps the customers to make their final buying decisions.
- *Trying to be consistent*—Being consistent is one of the important factors in social media marketing. Reliable and constant messages help to improve the identity of the organization, and it also helps in promoting brand perception among customers. The key messages of the organization should be clear and specific so that the customers can understand the brand and the products.

6 Conclusion and Limitations

From this research, it is seen that all the independent variables including social media marketing, promotional marketing and door to door marketing, have effects on the dependent variable consumer perception. Hypotheses Analysis is done through PLS analysis too. From this PLS analysis, it can be said that social media marketing has a direct positive impact on consumer perception which is 0.254. So, H1 is accepted. Social media marketing also has a positive impact on promotional marketing which is 0.605. So, H2 is accepted. Again, promotional marketing has a positive impact on consumer perception which is 0.109 and H3 is supported. So, it is proved that social media marketing has a direct and indirect impact on consumer perception. The PLS analysis also sees that door to door marketing also has an impact on consumer perception which is 0.236 and H4 is accepted though this impact is less powerful compared to the impact of social media marketing on consumer perception.

Limitations of any research show that there are future possibilities for further research. This research helps to assess the impacts of social media marketing on consumer perception. The research shows that there is a positive but not very strong impact of social media marketing on consumer perception. Again, it is seen than door to door marketing also has positive but weak impacts on consumer perception. On the other hand, social media marketing has a comparatively strong positive impact on promotional marketing, and promotional marketing has weak but positive impacts on consumer perception.

The data for the research purpose are gathered from the people that are involved in social media marketing and whose marketing decision mar dependent on social media. This research is exploratory. So, different responses may be collected from different people. If the data were collected from the group of people whose belief in the door to door marketing, the researcher would get the different result of the research. It is the fact that the preferences or choices of people vary from place to place. Different people may act differently in case of seeing an advertisement for a product on social media. All the people do not love to buy online products and they believe in the authenticity of the products sold through the door to door marketing. If the research were performed in the locality where social media is not considered as very popular technology towards buying products, then the research result would be different. Another limitation was the limited time to perform this research. If the data were collected from a larger group of people who are comfortable in social media marketing as well as door to door marketing, then the research result would be more accurate. However, more time would have been needed to collect more data. So, more time in the future will help the researcher to produce a more accurate research result.

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The Impacts of Social Media on Managing Customer Relationships with Brands in the UK

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Abstract This research is done to understand the impacts of social media in managing customer relationships for the selling business organizations within the b2b business environment. In today's world, the use of social media has increased rapidly. The selling business organizations use social media sites as their marketing tool. However, now, it is time for them to understand that social media sites can be used towards improving customer relationship performance. SEM-PLS model is used in this research to understand the effects of social media as the relationship tool. The data collected for the research shows that the use of social media has a direct positive impact on social CRM capabilities, which has a direct positive impact on customer relationship performance. The researcher has discussed the research result elaborately. In the end, proper implications, limitations, and recommendations are discussed by the researcher.

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_4

Keywords Customer relationship orientation · Business-to-business · Social media · CRM · Social CRM · Customer relationship performance · CRM in b2b · Social media in b2b · Social CRM in b2b · PLS-SEM model

1 Introduction

With the passing time, social media is becoming more powerful in maintaining customer relationships as people are becoming more active in communicating, sharing information, and creating social media contents day by day (Al-Maroof et al., 2021a; Nuseir et al., 2021b; El Refae et al., 2021). As per the opinion of Felix et al. (2017), Al-Hamad et al. (2021), and Suleman et al. (2021), the use of smart devices and social media will even increase more in the coming years. Different companies now spend more of their money on the social media platform rather than spending them on the traditional media (Akour et al., 2021; Alshurideh et al., 2021a; Kurdi et al., 2020b). Della Corte et al. (2015) stated that approximately 92% of the marketing divisions of different companies agreed that social media is essential for their business as it helps to create high value towards the business. Nowadays, the business organizations utilize social media sites properly to enhance and maintain customer relationships, to market through word of mouth, to generate community-based customer support and to co-creation (Abu Zayyad et al., 2021; Al Khasawneh et al., 2021a; Alshurideh et al., 2019b; Turki Alshurideh, 2014). Noe et al. (2017) added that organizations now use their existing customer database for improving their Customer Relationship Management (CRM), and in this process, they adopt the involvement of social media (Al Khasawneh et al., 2021b; Al Kurdi et al., 2021a; Aljumah et al., 2021a; Alshurideh et al., 2019a), which is known as Social Customer Relationship Management (SCRM).

The previous researches show the effectiveness of social media in the b2c (Business to Customer) context, including improving customer relationships towards increasing brand awareness, loyalty, and company sales (Alameeri et al., 2021; Almazrouei et al., 2020; Joghee et al., 2021b; Kabrilyants et al., 2021; Nuseir et al., 2021a). Kumar et al. (2016) opined that similar benefits could be achieved in the context of b2b (business to business). However, there were few numbers of researches done on the benefits of social media in b2b context. As per the statement of Felix et al. (2017), b2b marketers understood the potentiality of social media towards improving customer relationships and also enhancing brand value and how it can be achieved by following the path followed by the b2c marketers (Alshurideh et al., 2019d; Hamadneh & Al Kurdi, 2021; Hamadneh et al., 2021). Customers are a valuable financial asset for b2b companies. Noe et al. (2017) expected that there should be an increase in the significance of the SCRM in b2b organizations. It will help to improve the company's business performance through engaging more customers and creating more values through these customer engagements.

This research aims to understand the importance of Social Media on Customer Relationship Management activities in the b2b context. Kumar et al. (2016) and

Alshurideh (2022) stated that previous researches were focused either on the CRM in the b2b context or Social Media in a b2b context. The primary purpose of this research is to test the process through which the business organizations in the UK properly utilize Social Media as their CRM tool in the b2b context. The below section shows the research questions which are drawn for this particular research study.

Research Question 1: What are the impacts of Social Media as the Customer Relationship Management tool on b2b customer relationships?

The answer to this question will help the researcher to understand how organizations improve their b2b customer relationships through their social media activities by using it as the customer relationship management tool. It will provide the company's perspective.

Research Question 2: How social media as a CRM tool create a match between the expectations of the company and the experience of its customers?

By answering this research question, the researcher will assess if the expectations of the companies match the real situation. It will provide the customer's perspective.

2 Conceptual Framework and Hypotheses Development

In this section, the previous related theories about the research topic will be discussed. The development of a conceptual framework and research hypotheses will also be done in this section.

2.1 Concept of Business-To-Business (b2b)

Business to business (b2b) marketing is entirely different from business to customer (b2c) marketing. Stott et al. (2016) observed that before any product comes to the b2c market, it needs to pass different stages involved in the b2b market. Before selling any product to its final consumer, the producer organization needs to sell that product to the wholesalers. So, the wholesalers or the retailers at first buy different products from the producer companies, and then they sell those products to the final consumers (Alshurideh et al., 2017, 2019c, 2021b; Obeidat et al., 2019). As per the opinion of Wirtz et al. (2016), unlike the b2c market, in the b2b market, there are a smaller number of buyers who buy in a more substantial amount. The demand in the b2b market comes from the demand made by the end customers. It is a complex process, so many professional people are involved in evaluating different criteria. These professional people need information about the products and also the demands of the end consumers (Al Kurdi & Alshurideh, 2021; Al-Dmour & Al-Shraideh, 2008; Alshurideh, 2016). According to Stott et al. (2016), a business relationship performs an important part that needs to be researched more within the b2b context.

2.2 Concept of Social Media in b2b Context

As per the opinion of Agnihotri et al. (2016), social media plays an essential part in the process of promoting different products towards customers. It also helps in making and maintaining a strong relationship between the selling companies and the customers (Al-Dhuhouri et al., 2020; Alshurideh, 2017; Alshurideh et al., 2016; Hayajneh et al., 2021; Svoboda et al., 2021). Several social media channels are there to help in performing social media marketing. Siamagka et al. (2015) noted that the selling organizations share the messages, photos, product descriptions, video, and audio files about their products through social media channels. These organizations make their online presence through different social media channels (Ahmad et al., 2021; Alaali et al., 2021; Joghee et al., 2021a). Cawsey and Rowley (2016) added that there are mainly five types of social media are blogs, microblogs, social networks, collaboration community, and content sharing community. It is hard to categorize these different applications of SM as the obstructions among different categories overlie each other.

B2c companies mostly use SM instead of b2b companies. Most of the uses of SM by the b2b companies are done for their internal and external processes through internal use is more than external use. As per the statement made by Wang et al. (2016), social networking sites, blogs, microblogs, and discussion forums are the most effective and popular tools for the external use of SM towards their customers. Siamagka et al. (2015) stated that project communication, communication, and collaboration, and network management are three essential functions of partner-related use of SM. SM provides sales support and helps in making communication with partner organizations and customers. Some barriers come when SM is used in the b2b context, which includes inappropriate measurement of the efficiency of SM, a high priority of the other projects, a lack of proper understanding of the available options, a smaller number of related case studies, etc.

Wang et al. (2016) showed the advantages of using SM in b2b context, including increasing involvement of the customers, increased profitability through increased sales, increased customer loyalty, brand awareness, improved relationship with the customers, helping in providing improved customer services. Cawsey and Rowley (2016) added that one of the important advantages of SM is the low-cost coverage and high impact on the target customers at the same time. SM helps the b2b organizations to build personal interactions with their vendors and stakeholders, which ultimately helps in making a strong relationship that helps to improve their corporate credibility (Abuhashesh et al., 2021; Al-Dmour et al., 2021a; Harahsheh et al., 2021; Leo et al., 2021). Agnihotri et al. (2016) stated that proper and effective b2b sales decisions might generate higher sales for the organizations in the long term. SM helps in the process of transaction that helps towards increasing sales for the current customers and also helps in the promotional process for the new customers (Alhamad et al., 2021; Ghazal et al., 2021; Madi Odeh et al., 2021). The organizations that use SM as their marketing tool use SM towards setting up their companies as the leaders, increasing brand awareness, and making contacts with their stakeholders. Siamagka

et al. (2015) informed that SM also helps the organizations towards optimizing the search engine results and also helps in increasing their website homepage traffic.

2.3 Concept of Customer Relationship Management (CRM)

As per the opinion of Terziev and Banabakova (2017), customer relationship management (CRM) is a strategic management approach that includes the strategies, practices, and technologies used by the organizations towards analyzing and managing their interaction with their customers. It helps the companies to use the customer lifecycle data towards achieving the goal towards enhancing the relationships with the customers, retaining their existing customers, and improving the sales (Al-Dmour et al., 2014; Alshurideh, 2012; Zu'bi et al., 2012). Hassan et al. (2015) stated that CRM helps the organizations to collect and save the data about their customers across various points of contact or channels between the organization and their customers (Al Kurdi et al., 2021b; Al-Dmour et al., 2021b; Shannak et al., 2012; Sweiss et al., 2021). These points of contact or channels include the company's website, live chat, telephone, direct mail, and of course, social media (Al-Khayyal et al., 2021; Alsharari & Alshurideh, 2021; Alshurideh et al., 2020; Kurdi et al., 2020a; Obeidat et al., 2021). Terziev and Banabakova (2017) added that effective CRM provides the detailed needed personal information of the customers to the customer care employees of the organization. It also provides the buying preferences of the customers, their purchase history, and also their anxiety.

2.4 CRM in the Context of b2b

Lipiäinen (2015) observed that as in the b2b context, there are a smaller number of customers and a higher volume of purchase compared to the b2c context, CRM is more important for b2b compared to b2c context. The organizations are forced to generate and maintain a closer relationship with their lower number of customers within the b2b context. It helps the organizations towards minimizing the risk and also generating maximum value. As per the opinion of Kumar and Reinartz (2018), there are three different perspectives in managing customer asset, which includes relationship, sales, and network. Among these perspectives, the network helps the organizations in maintaining the highest depth in managing their customer assets. It also provides maximum scope for the customer care managers of the organizations to generate value within the organization-customer environment. Aissani and Awad ElRefae (2021) and Lipiäinen (2015) added that customers are one of the important assets of the organization, and without the customers, the organizations cannot achieve a competitive advantage.

2.5 Social CRM in the Context of b2b

According to Nunan et al. (2018), social CRM is the customer relationship management that can be achieved by organizations through making communication with their customers through social media sites such as Facebook or Twitter. Social CRM helps organizations to interact with their customers with a particular brand, and also it helps to improve the relationship with their customers. Agnihotri et al. (2016) and Nuseir et al. (2021b) defined the uses of social CRM in the b2b context as it helps in making social sales, internal collaboration, and building sales genius. The organization can increase social sales by using the social information of their customers. It is provided by social CRM, which helps to maintain the relationship with the current customers and also build a new relationship with the new customers within the b2b context. Guesalaga (2016) informed that social CRM helps organizations in making internal or partner collaboration through consumer's social networks. Again, Social CRM helps to build sales genius, which helps the organizations to find similar types of customers that might desire to buy similar products or services.

2.6 Hypotheses Development

2.6.1 Customer Relationship Orientation

Lee and Hwang (2016) observed that it is very much important to understand market orientation to understand customer relationship orientation (CRO) as these two are interrelated. Market orientation helps to understand the demands and needs of the customers and also helps to fulfill those needs. On the other hand, Aljumah et al. (2021b) and Terho et al. (2015) opined that CRO helps organizations to concentrate on customer loyalty, retention, and the mutual relationship between the customers and the organizations during the business acts. The relationship marketing principle is also related to CRO, which shows that a competitive advantage can be gained and maintained by satisfying the needs of the customers. It can be done by maintaining continuous mutual beneficial relationships.

2.6.2 Social CRM Capabilities

As per the information provided by Elsaadani (2020), Kamboj et al. (2016), and Al Batayneh et al. (2021), social CRM capabilities show the competencies of the organizations towards developing, incorporating, and responding to the information collected from the interactions with their customers through social media. There are three dimensions of the social CRM capabilities, including generating information, disseminating information, and responsiveness towards this information. Sigala (2016) noted that the organizations that use high-level social media technology use

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SM technology along with the customer-centric management system, which helps to generate more SCRM capabilities compared to the competitor companies that use a comparatively low level of SM technology. So, it can be said that social CRM capabilities create a relationship between the use of social media and customer relationship performance.

H_1: Customer relation orientation is positively related to social CRM capabilities.

2.6.3 Social Media Use

Four functions of social media are essential for CRM, including relationships, conversations, groups, and sharing. As per the opinion of Boulianne (2015), relationships include a set of technologies with the help of which the business organizations and their customers generate association networks. The organizations gather and use the information from these networks. Again, the conversation is used as applications that help in accelerating the activities of the organizations with their customers and also gather information about the customers from the conversation. Aichner and Jacob (2015) added that groups include the technological means which helps in the development of the communities and sub-communities for the online users, which are focused on particular products, topics, or brands. In Sharing, interacting, and sharing information with the customers are performed by the organization with different processes and activities. Boulianne (2015) stated that sharing helps organizations to get a positive effect in managing relationships with their customers.

H_2: Social media use has a positive relationship with social CRM capabilities.

H_3: Customer relationship orientation is positively related to social media use.

2.6.4 Customer Relationship Performance

Hassan et al. (2015) stated that Customer relationship performance could be achieved when CRM is successfully implemented as it helps in increasing the profits and values for the organizations and as well as for the customers. Effective CRM helps organizations in providing improved customer service, increasing marketing efficiency, improving competitiveness, reducing costs, increasing customer loyalty and market awareness, and increasing profitability. For this research, CRP is represented as the degree for measuring customer satisfaction, retention, and loyalty.

H_4: Social CRM capabilities have a positive relationship with customer relationship performance.

H_5: Customer relation orientation is positively related to customer relationship performance.

Figure 1 represents the research model, followed by the conceptual framework.

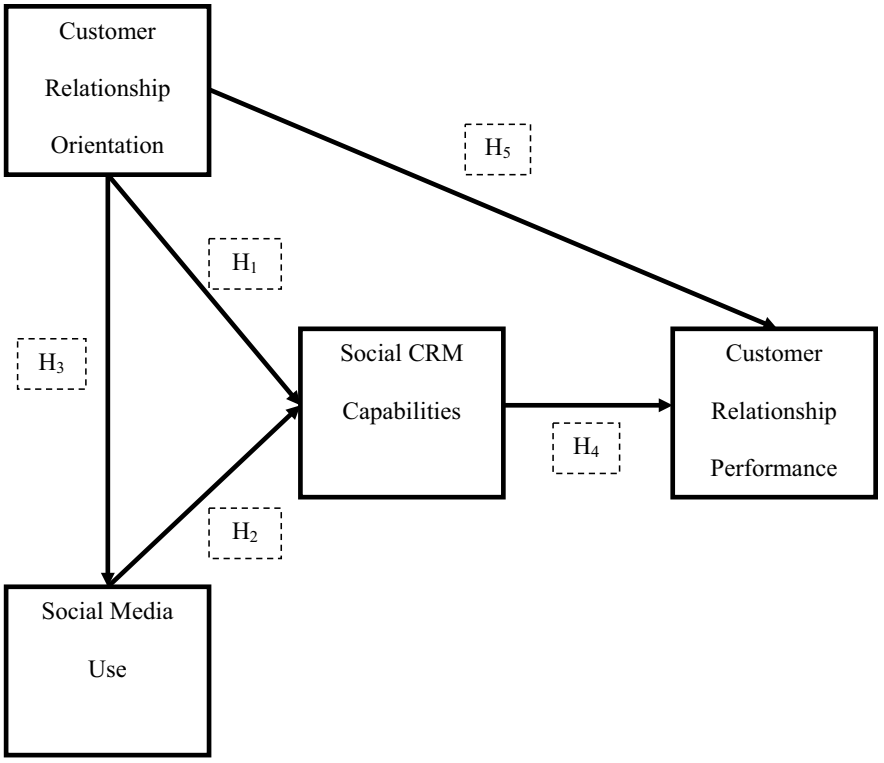

Fig. 1 Research model

3 Instrument Development and Data Collection

Instrument Development: A questionnaire will help to perform this research the researcher has used Likert scale from 5 = strongly agree to 1 = strongly disagree. Previous researchers have helped the researcher to develop this questionnaire, which has helped in enhancing the validity of the research. Customer relationship is one of the essential constructs for this research. In this research, the impacts of social media on customer relationships with the organizations are understood. Another construct for this research is social CRM capabilities. It is measured by customer relationship orientation. The dependent variable for this research is the customer relationship orientation, which is also a construct for this research.

Data Collection: The quantitative questionnaire is distributed among small business organizations in Birmingham, UK. The researcher sent the online questionnaire to the management of the chosen small business organizations through email. The chosen participants for this research are only the small business organization that buys products from the more prominent business organization and perform in the

b2b context by using social media. The researcher sent 50 soft copies of questionnaires to the small business organizations through emails. The researcher got a total of 35 responses after four weeks of sending the emails.

Research Method: The researcher has used Structural Equation Modelling (SEM) for this research. The researcher has also used the Partial Least Square (PLS) method. Al-Maroof et al. (2021b) observed that the PLS method helps the researcher to understand complex data within the low-structured situation. Hult et al. (2018) informed that PLS is very much useful in the areas of social media as it is tough to get any theoretical information in this area. PLS helps the researcher to assess the validity and reliability of the research. The researcher does significance testing by using the resampling method.

4 Results

The researcher gathers all the needed information through the quantitative questionnaire. The researcher prepared the quantitative questionnaire and emailed them to the target small business organizations that are involved in the b2b business with the more prominent business organizations. The researcher sent the email with the questionnaire to 50 small business organizations. Among them, only 35 organizations replied with all the needed information for this research. This whole process of data collection took approximately 4 weeks. The reliability and validity of the structural model for this research will be explained in this section in a detailed manner.

Reliability

Cronbach's Alpha shows composite reliability. The value of Cronbach's Alpha should be greater than 0.7. Cronbach's Alpha helps in testing the reliability of the survey of any research. Trizano-Hermosilla and Alvarado (2017) added that it is also used in measuring internal consistency for any research. The value of Cronbach's Alpha for this testing is more than 0.7. From the below table, it can be said that the reliability is accepted for this particular research. The below table shows the overview of quality criteria.

Validity

The validity of this research is tested with the help of content validity and construct validity. Within the content validity, face validity is tested through this research. Face validity testing is performed by sending the quantitative questionnaire to the small business organizations involved in the b2b marketing through emails and asking the company marketing personals to fill up those forms. The researcher has taken into account the substantial literature review. The constructs for this research are Customer Relationship Orientation, social media use, and Social Customer Relationship Management Capabilities. These constructs have helped the researcher in the information system. Currently, available research works on the similar topic

have helped the researcher to prepare the quantitative questionnaire. The information gathers through these quantitative questionnaires have helped the researcher enrich the research contents. As per the opinion of Yamato et al. (2017), convergent validity can be ensured through assessing discriminant and convergent validity. AVE shows the Average Variance Extracted, and it performs as a criterion. Alarcón et al. (2015) added that AVE is used to measure and test convergent validity. The value of AVE is always expected to be more than 0.5. Table 1 shows the values of AVE and all the AVE for all the constructs are more than 0.5. Cegarra-Navarro et al. (2016) stated that in the case of discriminant validity, PLS helps to measure the extent up to the level where there is a difference between a particular construct with the other constructs. The value of composite reliability should always be more than AVE, and also it should be more than 0.7. It is seen from Table 1 that the value of composite reliability is more than 0.7 and more than the value of AVE for all constructs. So, from Table 1, it can be understood that the validity of this research is accepted.

Square of correlation among the latent variables is shown in Table 2 where cross loadings are shown in Table 3. Divergent validity testing for this research can be done with the help of Tables 2 and 3.

As per the opinion of Alarcón et al. (2015), it is needed to confirm that the value of Average Variance Extracted (AVE) is more than the divergent validity, the value of MSV (Maximum Shared Squared Variance) and value of ASV (Average Shared Squared Variance).

AVE > MSV

AVE > ASV

It is seen from Table 2 that

0.986671 > {0.02772, 0.042641, 0.173419} and

0.714738 > {0.02772, 0.142834, 0.119818} and

0.749631 > {0.042641, 0.142834, 0.703512} and

0.855889 > {0.173419, 0.119818, 0.703512}.

Cegarra-Navarro et al. (2016) observed that it is important to assess the discrimination validity to compare the square of the correlations among the variables with the AVE. Table 2 shows the square of correlations among different latent variables. It will help to confirm the discriminant validity. Yamato et al. (2017) added that testing the factor loadings for every indicator helps to get a two-fold result for the convergent

Table 1 Overview of quality criteria

	AVE	Composite reliability	R square	Cronbach's alpha
Customer relationship orientation	0.97352	0.986582		0.9728
Social media use	0.510851	0.764277	0.340768	0.947628
Social customer relationship management capabilities	0.561947	0.752086	0.421899	0.85566
Customer relationship performance	0.732546	0.890322	0.7816	0.810019

Table 2 Square of correlation between latent variables

	Customer relationship orientation	Social media use	Social customer relationship management capabilities	Customer relationship performance
Customer relationship orientation	**0.986671**			
Social media use	0.02772	**0.714738**		
Social customer relationship management capabilities	0.042641	0.142834	**0.749631**	
Customer relationship performance	0.173419	0.119818	0.703512	**0.855889**

and discriminant validity both. The factor loading for any indicator should always be more than its constructs when compared with other factors.

Cross loadings are shown in Table 3. It includes factor loadings of the indicators, which are more than their constructs comparing with other factors. The value of the red cells in every row of Table 3 should be more than the other cells of the same row. This condition confirms the divergent validity.

For CRO1, 0.9866 > {0.030976, 0.046624, 0.168913} and
For CRO2, 0.986742 > {0.023745, 0.037545, 0.17329} and
For SMU1, 0.53156 > {0.001578, 0.077049, 0.015338} and
For SMU2, 0.859736 > {0.031766, 0.122122, −0.150665} and
For SCRMC1, 0.570522 > {0.050194, 0.145343, 0.540354} and
For SCRMC2, 0.870945 > {−0.012473, 0.110302, 0.628633} and
For SCRMC3, 0.121996 > {−0.094954, −0.159483, −0.71053} and
For SCRMC4, 0.776416 > {0.130899, 0.125381, 0.750261} and
For SCRMC5, 0.886804 > {−0.019179, −0.096823, 0.64445} and
For SCRMC6, 0.810901 > {−0.00188, 0.077145, 0.70523} and
For SCRMC7, 0.662697 > {0.053638, 0.003076, 0.658247} and
For SCRMC8, 0.722868 > {0.003081, −0.146486, 0.474074} and
For CRP1, 0.726161 > {0.194897, 0.11079, 0.656614} and
For CRP2, 0.872359 > {0.035171, −0.271159, 0.731392} and
For CRP3, 0.953581 > {0.209034, −0.129291, 0.841247} and
For CRP3, 0.953114 > {−0.20903, 0.175248, 0.821993}.

Table 3 confirms that the validity of this research is obtained to an acceptable level. Tables 2 and 3 show that the divergent validity is also accepted for this research.

Tables 4, 5, and 6 help to perform a test of total effects. It is needed for all effects to be accepted; the T-statistics must be greater than |1.96| (Aissani & Awad ElRefae, 2021). The formula for calculating T-statistics is |Original Sample/Standard Error|.

Table 3 Cross loadings

	Customer relationship orientation	Social media use	Social customer relationship management capabilities	Customer relationship performance
CRO1	0.9866	0.030976	0.046624	0.168913
CRO2	0.986742	0.023745	0.037545	0.17329
SMU1	0.001578	0.53156	0.077049	0.015338
SMU2	0.031766	0.859736	0.122122	−0.150665
SCRMC1	0.050194	0.145343	0.570522	0.540354
SCRMC2	−0.012473	0.110302	0.870945	0.628633
SCRMC3	−0.094954	−0.159483	0.121996	−0.71053
SCRMC4	0.130899	0.125381	0.776416	0.750261
SCRMC5	−0.019179	−0.096823	0.886804	0.64445
SCRMC6	−0.00188	0.077145	0.810901	0.70523
SCRMC7	0.053638	0.003076	0.662697	0.658247
SCRMC8	0.003081	−0.146486	0.722868	0.474074
CRP1	0.194897	0.11079	0.656614	0.726161
CRP2	0.035171	−0.271159	0.731392	0.872359
CRP3	0.209034	−0.129291	0.841247	0.953581

Note CRO = customer relationship orientation; SMU = social media use; SCRMC = social customer relationship management capabilities; CRP = customer relationship performance

Table 4 shows that all values of T-statistics for this research are more than |1.96|, which confirms that all the effects are accepted for this particular research.

The test of total effects is shown in Tables 5 and 6. Ulrich et al. (2018) observed that values of R^2 for the three constructs for the research are 0.67, 0.33, and 0.19, which are considered comparatively as substantial, moderate, and weak.

Table 4 Test of total effects

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	Standard ERROR (STERR)	T statistics (|O/STERR|)
Customer relationship orientation -> Social CRM capabilities	0.038711	0.026131	0.109734	0.109734	4.352775
Social media use -> Social CRM capabilities	0.141761	0.053139	0.194107	0.194107	8.730325
Customer relationship orientation -> Social media use	0.02772	0.009774	0.136158	0.136158	9.203589
Social CRM capabilities -> Social relationship performance	0.867695	0.430055	0.755501	0.755501	11.1485
Customer relationship orientation -> Social relationship performance	0.13642	0.133173	0.047738	0.047738	2.857642

Table 5 Test of total effects

	R square
Customer relationship orientation	
Social media use	0.340768
Social customer relationship management capabilities	0.421899
Customer relationship performance	0.7816

Table 6 Test of total effects

Total	SSO	SSE	$Q^2 = 1 - SSE/SSO$
Social media use	472	270.899207	0.426061
Social customer relationship management capabilities	1888	1069.851936	0.433341
Customer relationship performance	708	291.033761	0.588935

$$R^2 \begin{cases} 0.19 \text{ Weak} \\ 0.33 \text{ Moderate} \\ 0.67 \text{ Substantial} \end{cases}$$

$$Q^2 \begin{cases} 0.02 \text{ Weak} \\ 0.15 \text{ Moderate} \\ 0.35 \text{ Substantial} \end{cases}$$

$$Q^2 = 1 - SSE/SSO$$

From Table 5, it can be said that the values of R^2 for Social Media Use and Customer Relationship Management Capabilities are moderate, and the value of R^2 for Customer Relationship Performance is Substantial. From Table 6, it is seen that all the values of Q^2 are substantial.

The test of Goodness of Fit (GOF) is shown in Table 7.

$$GOF \begin{cases} 0.01 \text{ Weak} \\ 0.25 \text{ Moderate} \\ 0.36 \text{ Substantial} \end{cases}$$

$$\begin{aligned} GOF &= \sqrt{\left[\{\text{Average}\left(R^2\right) \times \text{Average (Community)}\}\right]} \\ &= \sqrt{[0.51 \times 0.69]} = 0.5952 > 0.36 \end{aligned}$$

GOF is accepted for this particular research.

Table 7 Test of goodness of fit (GOF)

	Communality
Customer relationship orientation	0.97352
Social media use	0.732546
Social customer relationship management capabilities	0.561947
Customer relationship performance	0.510851

Structural Model

The researcher has used Smart PLS Analysis software to analyze the collected data for this research. Al-Maroof et al. (2021b) observed that the validity of the research could be assessed with the help of R^2s and structural paths. The path coefficients for this research should be positively important to be at the level of 0.05.

From Fig. 2, it can be stated that the R^2 of social CRM capabilities is approximately 0.33% of the variance in social CRM capabilities, which is accounted for the customer relationship orientation and social media use. Again, the R^2 of social media use is approximately 0.015% of the variance of social media use, which is accounted for the customer relationship orientation. The R^2 of the customer relationship performance is approximately 0.75% of the variance of customer relationship performance and accounted for the customer relationship orientation and social CRM capabilities. So, PLS analysis helps to understand the use of social media influences that customer relationship performance.

PLS analysis helps in performing hypotheses analysis. It is seen from the PLS analysis that customer relationship orientation has positive impacts on social CRM capabilities, which is 0.327. It can be said that H_1 is supported, and the customer relationship orientation has positive impacts on social CRM capabilities. PLS analysis also shows that customer relationship orientation has positive effects on social media use, which is 0.124. This value ensures that H_3 is supported and customer relationship

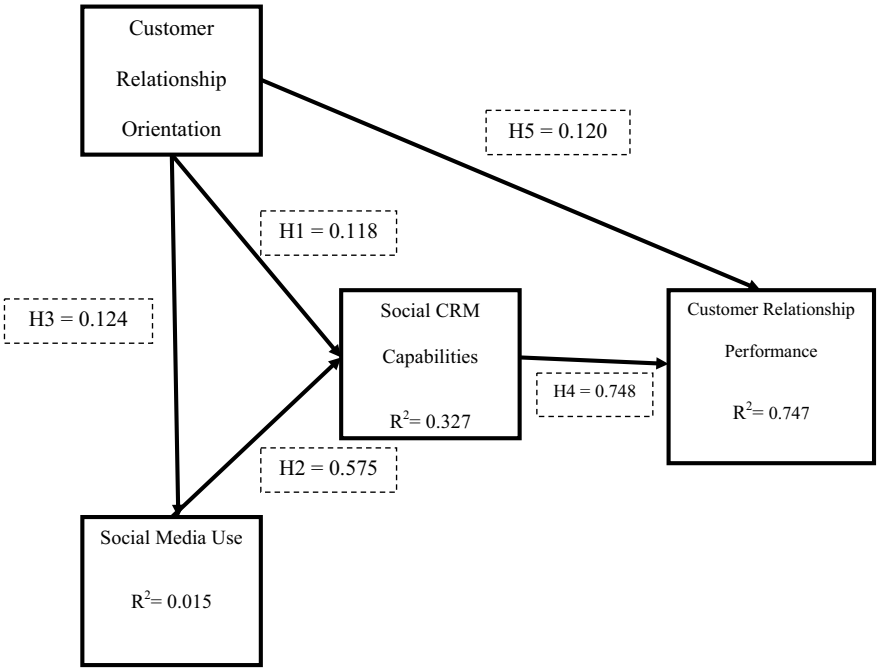

Fig. 2 Smart PLS analysis

orientation has a positive effect on social media use. Again, it is also seen that the use of social media sites has a positive effect on social CRM capabilities, which is 0.575. This value indicates that the use of social media has a very strong positive effect on social CRM capabilities. So, it ensures that H_2 is supported, and increasing the use of social media helps to enhance the social CRM capabilities. Social CRM capabilities have a strong positive effect on customer relationship performance, which is 0.748. So, it is seen that H_4 is supported. So, it can be said that ultimately, customer relationship orientation has a positive effect on customer relationship performance. Again, PLS analysis shows that customer relationship orientation has direct positive effects on customer relationship performance, which is 0.120. It proves that H_5 is a supporter, and customer relationship performance is positively affected by customer relationship orientation.

5 Discussion and Implications

The availability of the internet has increased in recent years, which have a significant impact on the buying decision of the customer companies and the selling companies within a b2b business environment. Social media sites help to provide needed information about the products towards buying small organizations. Social media sites help in making inter-connection between the buying companies and the selling companies through online forums, communities, ratings, recommendations, etc. These changes have created a new era in the b2b business through e-commerce. E-commerce allows the buying companies to rate the products they already bought or write reviews on that product. These ratings and reviews help other small business organizations in making their final buying decision. It helps to generate values towards both the buying and the selling organizations. The researcher has used the technology acceptance model in this research which has helped to present different constructs involved in this research. This research helps to understand the effects of social media in managing the customer relationships for the business organization with their small customer organizations within b2b business environment through social CRM capabilities.

The researcher has used the PLS-SEM model as it helped to test the validity and reliability of this research. This statistical model shows that customer relationship orientation is directly related to customer relationship performance. It is also seen that customer relationship orientation affects social media use. Again, social media use affects social CRM capabilities, which affect customer relationship performance. So, it can be said that social media use has an impact on customer relationship performance through social CRM capabilities. The PLS-SEM model shows that social media use has an indirect influence on customer relationship performance. The users of different social media sites have power towards creating online content such as recommendations and reviews through various online communities. These recommendations and reviews have direct effects on the buying intentions of the other customers, which are the other small business organizations in the case of b2b

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business. The result of this research shows that the increased use of social media has a direct effect on social customer relationship management capabilities, and it affects the customer relationship performance of the big selling business organizations to maintain their small customer organizations. Customer relationship orientation has positive effects on social CRM capabilities. Social media use also has positive effects on social CRM capabilities. Customer relationship orientation has positive impacts on social media use where social CRM capabilities have positive effects on customer relationship performance. It is seen from the PLS-SEM model that the positive effects of social media use on social CRM capabilities are very strong, which is 0.575, and the positive impacts of social CRM capabilities on customer relationship performance is also very strong which is 0.748. This proves that social media use has strong indirect positive impacts on customer relationship performance through social CRM capabilities.

The implications drawn by the researcher shows that it is needed to continue developing further social CRM capabilities through using the main two strong social media sites such as YouTube and Twitter. It will help not only to collect information but will also help to respond to this information. The selling organizations should focus on social analytics, live feeds, photo sharing, etc. as it will help to increase social CRM capabilities. The selling organizations should make more investment on social media sites as a CRM tool as it has positive impacts on customer relationship performance. The researcher has suggested for performing further research on the reason why YouTube plays the role of intermediary among social CRM capabilities and customer relationship orientation and their impacts. Future research should test the conceptual model with a larger sample size towards minimizing the research limitations.

Proper research ethics is maintained by the researcher while performing this research. The researcher promised the sample group of companies that the primary data collected from them will be used only for this research and will not be published anywhere else. The researcher maintained the privacy of these companies in an ethical manner. The quantitative questionnaire set by the researcher in this way so that they do not create any harmful effects on these companies. The researcher has maintained the code of ethics while performing this research.

6 Conclusion and Limitations

It is seen from this research that most of the business organizations involved in the b2b business do not understand the full value of using social media. Most of them still use social media as their marketing tool, and they do not realize that social media can be used for improving customer relationships. So, their customer relationship performances do not improve. It is also seen that some of the companies realized the full value of social media as a relationship tool, but they are in very early stages towards developing their social media strategies. These companies did not even

develop the needed social customer relationship management capabilities so that they can attain a higher customer relationship performance.

In conclusion, it can be said that the companies that are customer relationship-oriented, should use social media towards improving their customer relationship performance through developing social CRM capabilities. More and useful use of YouTube and Twitter may help the selling companies involved in the b2b business environment to develop more improved social CRM capabilities, and it may help these organizations to obtain a higher level of customer relationship performance.

Limitations of the research indicate that there are future scopes of the study. This researcher helps to understand the effects of social media in managing customer relationships for the selling business organizations within the b2b business environment. The research result shows that the use of social media has a strong positive impact on customer relationship performance. Though it is also seen that most of the companies do not realize that Social media can be used as a relationship tool, and they only utilize social media as their marketing tool. This research highlights that social media is a tool to make a quick response to their customers. Social media allows companies to engage with their customers. It helps to make a conversation with the customers. It helps the companies to ask their customer companies to provide feedback and also thank them for their valuable time to write the feedback. Social media helps the selling companies to provide personal touch towards their customer companies. Providing rewards towards customer companies through social media sites can be a way towards making an active community. Different contests and competitions through social media sites help to sell organizations to know more about their customer companies. Social media sites can be used by the selling organizations to provide their customer companies various promotional offers, sales, or coupons. Social media sites also help to sell organizations to find out their unhappy customers and the reasons for their unhappiness. It will help them to improve their services. The selling organizations should follow User-generated content (UGC) as it will inform the followers of that company that the ideas and views of the followers are taken into account towards building the brand. It will help to customer relationship performance of the selling organizations.

Like every other research, there are many limitations faced by the researcher while performing this research. One of the most critical limitations faced by the researcher at the time of performing quantitative research was that the sample size was too small. So that it was hard to find any particular conclusion as the research findings could be taken in any direction. The sample size should be increased to get the perfect research result. The small sample size influenced the validity, quality, and reliability of this research. More data should be collected to address the validity of the research. Another limitation faced by the researcher was that some customers were contacted partially by the companies on behalf of the researcher. This may provide incomplete information as in this case; the companies selected the customers whom they were comfortable to contact with. It may create a systematic error in the sample. Another limitation was that the companies always do not provide the correct information for maintaining the privacy of their companies. This may generate changes in the research result. The limited-time period was another major limitation of this research. Again,

another critical limitation was limited financial support. If the researcher would get more time and needed financial support, then the research would be more productive and specific with more required data.

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Impacts of Social Media on Managing Customer Relationships in b2b Business Environment in Birmingham, UK

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Abstract This research aims to understand the impacts of social media in managing customer relationships for the seller business organizations within the Business-to-Business (b2b) business environment. This research will help the seller organizations involved in b2b businesses to understand the full advantages of social media they can take towards achieving better customer relationship performance. Accordingly, the seller business organizations can use social media sites to improve social CRM capabilities and retaining more customers. The researcher has followed a descriptive research approach. Quantitative data were collected and used for this research. SEM-PLS model is used in this research. It can be said from the data analysis that social media has strong positive effects on building customer relationships within the b2b business environment though it is also seen that most of the organizations use social

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_5

media as only their marketing tool, and they do not use it as a relationship tool. The main limitations of this research were the small sample size, limited time, and limited financial support. More time, financial support, and bigger sample size will help to perform comprehensive research in the future.

Keywords Customer relationship orientation · Business-to-business · Social media · CRM · Social CRM · Customer relationship performance · CRM in b2b · Social media in b2b · Social CRM in b2b

1 Introduction

With the passing time, social media is becoming more powerful in maintaining customer relationships as people are becoming more active in communicating, sharing information, and creating social media contents day by day (Al Khasawneh et al., 2021a; Nuseir et al., 2021; Refae et al., 2021). As per the opinion of Felix et al. (2017), Al-Maroof et al. (2021), Aburayya and Salloum (2021), the use of smart devices and social media will even increase more in the coming years. Different companies now spend more of their money on the social media platform rather than spending them on the traditional media (Al Khasawneh et al., 2021b; Aljumah et al., 2021a; Almazrouei et al., 2020). Della Corte et al. (2015) stated that approximately 92% of the marketing divisions of different companies agreed that social media is significant for their business as it helps to create high value towards the business. Nowadays, the business organizations utilize social media sites properly to enhance and maintain customer relationships, to market through word of mouth, to generate community-based customer support and to co-creation (Abu Zayyad et al., 2021; Ahmad et al., 2021; Alshurideh et al., 2019a). Alshurideh (2012), Noe et al. (2017), Svoboda et al. (2021), Sweiss et al. (2021) added that organizations now use their existing customer database for improving their Customer Relationship Management (CRM), and in this process, they adopt the involvement of social media, which is known as Social Customer Relationship Management (SCRM).

The previous researches show the effectiveness of social media in the b2c (Business to Customer) context, including improving customer relationships towards increasing brand awareness, loyalty, and company sales (Hamadneh & Al Kurdi, 2021). Al-khayyal et al. (2020), Alshurideh et al. (2022), Kumar et al. (2016) opined that similar benefits could be achieved in the context of b2b (business to business). However, there were few numbers of researches done on the benefits of social media in b2b context. As per the statement of Felix et al. (2017), b2b marketers understood the potentiality of social media towards improving customer relationships and also enhancing brand value and how it can be achieved by following the path followed by the b2c marketers. Customers are a valuable financial asset for b2b companies. Noe et al. (2017) expected that there should be an increase in the significance of the

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SCRM in b2b organizations. It will help to improve the company's business performance through engaging more customers and creating more values through these customer engagements.

This research aims to understand the importance of Social Media on Customer Relationship Management activities in the b2b context. Kumar et al. (2016) stated that previous researches were focused either on the CRM in the b2b context or Social Media in a b2b context. The main purpose of this research is to test the process through which the business organizations in the UK properly utilize Social Media as their CRM tool in the b2b context. The below section shows the research questions which are drawn for this particular research study.

Research Question 1: What are the impacts of Social Media as the Customer Relationship Management tool on b2b customer relationships?

The answer to this question will help the researcher to understand how organizations improve their b2b customer relationships through their social media activities by using it as the customer relationship management tool. It will provide the company's perspective.

Research Question 2: How social media as a CRM tool create a match between the expectations of the company and the experience of its customers?

By answering this research question, the researcher will assess if the expectations of the companies match the real situation. It will provide the customer's perspective.

2 Conceptual Background

In this section, the previous related theories about the research topic will be discussed. The development of a conceptual framework and research hypotheses will also be done in this section.

3 Concept of Business-To-Business (B2B)

Business to business (b2b) marketing is entirely different from business to customer (b2c) marketing. Stott et al. (2016) observed that before any product comes to the b2c market, it needs to pass different stages involved in the b2b market. Before selling any product to its final consumer, the producer organization needs to sell that product to the wholesalers. So, the wholesalers or the retailers at first buy different products from the producer companies, and then they sell those products to the final consumers (Alketbi et al., 2020; Al-Khayyala et al., 2020; Alkitbi et al., 1261; Alshamsi et al., 2020; Alshurideh et al., 2020a; Alzoubi et al., 2020; Kurdi et al., 2020a). As per the opinion of Wirtz et al. (2016), unlike the b2c market, in the b2b market, there are a smaller number of buyers who buy in a more substantial amount. The demand in the b2b market comes from the demand made by the end customers. It is a complex process; so many professional people are involved in evaluating different criteria.

These professional people need information about the products and also the demands of the end consumers (Abuhashesh et al., 2021; Alshurideh, 2016, 2019; Alshurideh et al., 2012, 2016; Joghee et al., 2021). According to Stott et al. (2016), a business relationship performs an important part that needs to be researched more within the b2b context.

4 Concept of Social Media in B2B Context

As per the opinion of Nunan et al. (2018) social media plays an essential part in the process of promoting different products towards customers. It also helps in making and maintaining a strong relationship between the seller companies and the customers. Several social media channels are there to help in performing social media marketing. Siamagka et al. (2015) noted that the seller organizations share the messages, photos, product descriptions, video, and audio files about their products through social media channels. These organizations make their online presence through different social media channels (Abuhashesh et al., 2021; Alhamad et al., 2021; Al-Hamad et al., 2021; Alshurideh et al., 2021b; Nunan et al., 2018; Siamagka et al., 2015). Cawsey and Rowley (2016) added that there are mainly five types of social media are blogs, microblogs, social networks, collaboration community, and content sharing community. It is hard to categorize these different applications of SM as the obstructions among different categories overlie each other.

B2c companies mostly use SM instead of b2b companies. Most of the uses of SM by the b2b companies are done for their internal and external processes through internal use is more than external use. As per the statement made by Wang et al. (2016), social networking sites, blogs, microblogs, and discussion forums are the most effective and popular tools for the external use of SM towards their customers. Siamagka et al. (2015) stated that project communication, communication, and collaboration, and network management are three essential functions of partner-related use of SM. SM provides sales support and helps in making communication with partner organizations and customers. Some barriers come when SM is used in the b2b context, which includes inappropriate measurement of the efficiency of SM, a high priority of the other projects, a lack of proper understanding of the available options, a smaller number of related case studies, etc.

Wang et al. (2016) showed the advantages of using SM in b2b context, including increasing involvement of the customers, increased profitability through increased sales, increased customer loyalty, brand awareness, improved relationship with the customers, helping in providing improved customer services. Cawsey and Rowley, (2016), Elsaadani (2020) added that one of the important advantages of SM is the low-cost coverage and high impact on the target customers at the same time. SM helps the b2b organizations to build personal interactions with their vendors and stakeholders, which ultimately helps in making a strong relationship that helps to improve their corporate credibility. Nunan et al. (2018) stated that proper and effective b2b sales decisions might generate higher sales for organizations in the long term.

SM helps in the process of transaction that helps towards increasing sales for the current customers and also helps in the promotional process for the new customers (Al Kurdi et al., 2020; Al-Dmour et al., 2014; Alshurideh et al., 2019b, 2019c; Kurdi et al., 2020b). The organizations that use SM as their marketing tool use SM towards setting up their companies as the leaders, increasing brand awareness, and making contacts with their stakeholders. Siamagka et al. (2015) informed that SM also helps the organizations towards optimizing the search engine results and also helps in increasing their website homepage traffic.

5 Concept of Customer Relationship Management (CRM)

As per the opinion of Terziev and Banabakova (2017), customer relationship management (CRM) is a strategic management approach that includes the strategies, practices, and technologies used by the organizations towards analyzing and managing their interaction with their customers. It helps the companies to use the customer lifecycle data towards achieving the goal towards enhancing the relationships with the customers, retaining their existing customers, and improving the sales. Hassan et al. (2015) stated that CRM helps the organizations to collect and save the data about their customers across various points of contact or channels between the organization and their customers. These points of contact or channels include the company's website, live chat, telephone, direct mail, and of course, social media. Terziev and Banabakova (2017) added that effective CRM provides the detailed needed personal information of the customers to the customer care employees of the organization. It also provides the buying preferences of the customers, their purchase history, and also their anxiety.

6 CRM in the Context of B2B

Lipiäinen (2015) observed that as in the b2b context, there are a smaller number of customers and a higher volume of purchase compared to the b2c context, CRM is more critical for b2b compared to b2c context. The organizations are forced to generate and maintain a closer relationship with their lower number of customers within the b2b context. It helps the organizations towards minimizing the risk and also generating maximum value. As per the opinion of Aljumah et al. (2021b), Kumar and Reinartz (2018), there are three different perspectives in managing customer asset, which includes relationship, sales, and network. Among these perspectives, the network helps the organizations in maintaining the highest depth in managing their customer assets (Alshurideh, 2012; Hamadneh et al., 2021; Turki Alshurideh, 2014). It also provides maximum scope for the customer care managers of the organizations to generate value within the organization-customer environment. Lipiäinen

(2015), Nuseir et al. (2021) added that customers are one of the essential assets of the organization, and without the customers, the organizations cannot achieve a competitive advantage.

7 Social CRM in the Context of B2B

According to Nunan et al. (2018), social CRM is the customer relationship management that can be achieved by organizations through making communication with their customers through social media sites such as Facebook or Twitter. Social CRM helps organizations to interact with their customers with a particular brand, and also it helps to improve the relationship with their customers. Nunan et al. (2018) defined the uses of social CRM in the b2b context as it helps in making social sales, internal collaboration, and building sales genius. The organization can increase social sales by using the social information of their customers. It is provided by social CRM, which helps to maintain the relationship with the current customers and also build a new relationship with the new customers within the b2b context. Aissani and Awad ElRefae (2021), Guesalaga (2016) informed that social CRM helps organizations in making internal or partner collaboration through consumer's social networks. Again, Social CRM helps to build sales genius, which helps the organizations to find similar types of customers that might desire to buy similar products or services.

8 Hypotheses Development

8.1 Customer Relationship Orientation (CRO)

Lee and Hwang (2016) observed that it is very much important to understand market orientation to understand customer relationship orientation (CRO) as these two are interrelated. Market orientation helps to understand the demands and needs of the customers and also helps to fulfill those needs. On the other hand, Terho et al. (2015) opined that CRO helps organizations to concentrate on customer loyalty, retention, and the mutual relationship between the customers and the organizations during the business acts. The relationship marketing principle is also related to CRO, which shows that a competitive advantage can be gained and maintained by satisfying the needs of the customers. It can be done by maintaining continuous mutual beneficial relationships.

8.2 Social CRM Capabilities

As per the information provided by Kamboj et al. (2016), social CRM capabilities show the competencies of the organizations towards developing, incorporating, and responding to the information collected from the interactions with their customers through social media. There are three dimensions of the social CRM capabilities, including generating information, disseminating information, and responsiveness towards this information. Sigala (2016) noted that the organizations that use high-level social media technology use the SM technology along with the customer-centric management system, which helps to generate more SCRM capabilities compared to the competitor companies that use a comparatively low level of SM technology. So, it can be said that social CRM capabilities create a relationship between the use of social media and customer relationship performance.

H_1: Customer relation orientation is positively related to social CRM capabilities.

8.3 Social Media Use

Four functions of social media are essential for CRM, including relationships, conversations, groups, and sharing. As per the opinion of Boulianne (2015), relationships include a set of technologies with the help of which the business organizations and their customers generate association networks. The organizations gather and use the information from these networks. Again, a conversation is used as an application that helps in accelerating the activities of the organizations with their customers and also gathers information about the customers from the conversation. Aichner and Jacob (2015) added that groups include the technological means which helps in the development of the communities and sub-communities for the online users, which are focused on particular products, topics, or brands. In Sharing, interacting, and sharing information with the customers are performed by the organization with different processes and activities. Boulianne (2015) stated that sharing helps organizations to get a positive effect in managing relationships with their customers.

H_2: Social media use has a positive relationship with social CRM capabilities.

H_3: Customer relationship orientation is positively related to social media use.

9 Customer Relationship Performance

Hassan et al. (2015) stated that Customer relationship performance could be achieved when CRM is successfully implemented as it helps in increasing the profits and values for the organizations and as well as for the customers. Effective CRM helps organizations in providing improved customer service, increasing marketing efficiency, improving competitiveness, reducing costs, increasing customer loyalty and market

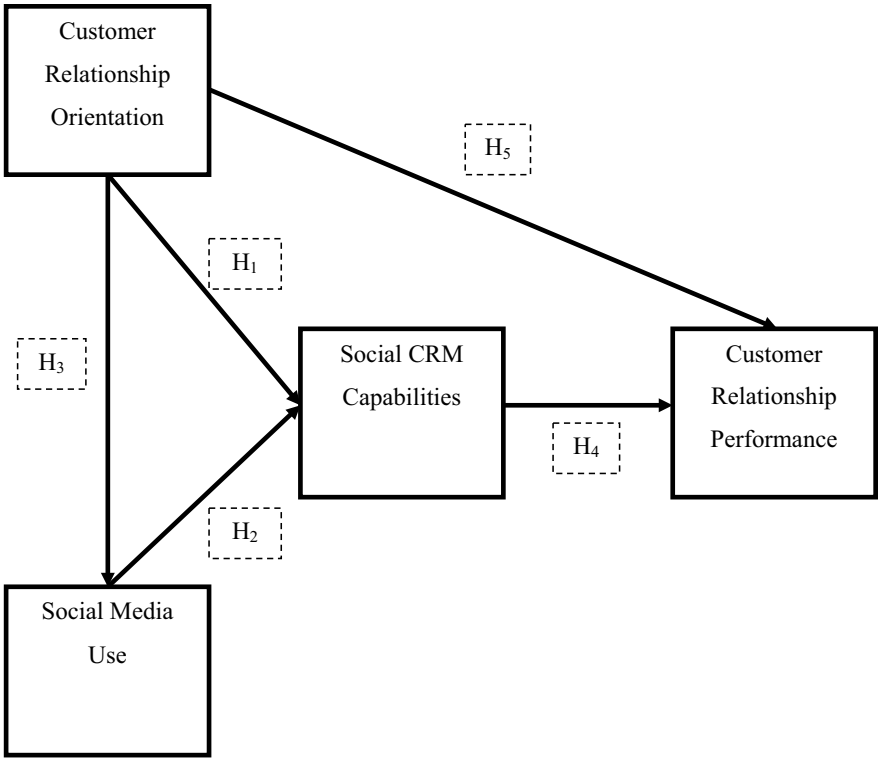

Fig. 1 Research model

awareness, and increasing profitability. For this research, CRP is represented as the degree for measuring customer satisfaction, retention, and loyalty.

H_4: Social CRM capabilities have a positive relationship with customer relationship performance.

H_5: Customer relation orientation is positively related to customer relationship performance.

Figure 1 represents the research model, followed by the conceptual framework.

10 Method

Instrument Development: A questionnaire will help to perform this research the researcher has used Likert scale from 5 = strongly agree to 1 = strongly disagree. Previous researchers have helped the researcher to develop this questionnaire, which has helped in enhancing the validity of the research. Customer relationship is one of the essential constructs for this research. In this research, the impacts of social media on customer relationships with the organizations are understood. Another construct

for this research is social CRM capabilities. It is measured by customer relationship orientation. The dependent variable for this research is the customer relationship orientation, which is also a construct for this research.

Data Collection: The quantitative questionnaire is distributed among small business organizations in Birmingham, UK. The researcher sent the online questionnaire to the management of the chosen small business organizations through email. The chosen participants for this research are only the small business organization that buys products from the more significant business organization and perform in the b2b context by using social media. The researcher sent 50 soft copies of questionnaires to the small business organizations through emails. The researcher got a total of 35 responses after four weeks of sending the emails.

Research Method: The researcher has used Structural Equation Modelling (SEM) for this research. The researcher has also used the Partial Least Square (PLS) method. Al-Maroof et al. (2021) observed that the PLS method helps the researcher to understand complex data within the low-structured situation. Hult et al. (2018) informed that PLS is very much useful in the areas of social media as it is tough to get any theoretical information in this area. PLS helps the researcher to assess the validity and reliability of the research. The researcher does significance testing by using the resampling method.

11 Results and Discussion

The researcher gathers all the needed information through the quantitative questionnaire. The researcher prepared the quantitative questionnaire and emailed them to the target small business organizations that are involved in the b2b business with the more prominent business organizations. The researcher sent the email with the questionnaire to 50 small business organizations. Among them, only 35 organizations replied with all the needed information for this research. This whole process of data collection took approximately 4 weeks. The reliability and validity of the structural model for this research will be explained in this section in a detailed manner.

11.1 Reliability

Cronbach's Alpha shows composite reliability. The value of Cronbach's Alpha should be greater than 0.7. Cronbach's Alpha helps in testing the reliability of the survey of any research. Trizano-Hermosilla and Alvarado (2016) added that it is also used in measuring internal consistency for any research. The value of Cronbach's Alpha for this testing is more than 0.7. From the below table, it can be said that the reliability is accepted for this particular research. The below table shows the overview of quality criteria.

11.2 Validity

The validity of this research is tested with the help of content validity and construct validity. Within the content validity, face validity is tested through this research. Face validity testing is performed by sending the quantitative questionnaire to the small business organizations involved in the b2b marketing through emails and asking the company marketing personals to fill up those forms. The researcher has taken into account the substantial literature review. The constructs for this research are Customer Relationship Orientation, social media use, and Social Customer Relationship Management Capabilities. These constructs have helped the researcher in the information system. Currently, available research works on the similar topic have helped the researcher to prepare the quantitative questionnaire. The information gathers through these quantitative questionnaires have helped the researcher enrich the research contents. As per the opinion of Wirtz et al. (2016), convergent validity can be ensured through assessing discriminant and convergent validity. AVE shows the Average Variance Extracted, and it performs as a criterion. Alarcón et al. (2015) added that AVE is used to measure and test convergent validity. The value of AVE is always expected to be more than 0.5. Table 1 shows the values of AVE and all the AVE for all the constructs are more than 0.5. Cegarra-Navarro et al. (2016) stated that in the case of discriminant validity, PLS helps to measure the extent up to the level where there is a difference between a particular construct with the other constructs. The value of composite reliability should always be more than AVE, and also it should be more than 0.7. It is seen from Table 1 that the value of composite reliability is more than 0.7 and more than the value of AVE for all constructs. So, from Table 1, it can be understood that the validity of this research is accepted.

Square of correlation among the latent variables is shown in Table 2, where cress leadings are shown in Table 3. Divergent validity testing for this research can be done with the help of Tables 2 and 3.

As per the opinion of Alarcón et al. (2015), it is needed to confirm that the value of Average Variance Extracted (AVE) is more than the divergent validity, the value of MSV (Maximum Shared Squared Variance) and value of ASV (Average Shared Squared Variance).

Table 1 Overview of quality criteria

	AVE	Composite reliability	R square	Cronbach's alpha
Customer relationship orientation	0.97352	0.986582		0.9728
Social media use	0.510851	0.764277	0.340768	0.947628
Social customer relationship management capabilities	0.561947	0.752086	0.421899	0.85566
Customer relationship performance	0.732546	0.890322	0.7816	0.810019

Table 2 Square of correlation between latent variables

	Customer relationship orientation	Social media use	Social customer relationship management capabilities	Customer relationship performance
Customer relationship orientation	0.986671			
Social media use	0.02772	0.714738		
Social customer relationship management capabilities	0.042641	0.142834	0.749631	
Customer relationship performance	0.173419	0.119818	0.703512	0.855889

Table 3 Cross loadings

	Customer relationship orientation	Social media use	Social customer relationship management capabilities	Customer relationship performance
CRO1	0.9866	0.030976	0.046624	0.168913
CRO2	0.986742	0.023745	0.037545	0.17329
SMU1	0.001578	0.53156	0.077049	0.015338
SMU2	0.031766	0.859736	0.122122	−0.150665
SCRMC1	0.050194	0.145343	0.570522	0.540354
SCRMC2	−0.012473	0.110302	0.870945	0.628633
SCRMC3	−0.094954	−0.159483	0.121996	−0.71053
SCRMC4	0.130899	0.125381	0.776416	0.750261
SCRMC5	−0.019179	−0.096823	0.886804	0.64445
SCRMC6	−0.00188	0.077145	0.810901	0.70523
SCRMC7	0.053638	0.003076	0.662697	0.658247
SCRMC8	0.003081	−0.146486	0.722868	0.474074
CRP1	0.194897	0.11079	0.656614	0.726161
CRP2	0.035171	−0.271159	0.731392	0.872359
CRP3	0.209034	−0.129291	0.841247	0.953581

Note CRO = Customer Relationship Orientation; SMU = Social Media Use; SCRMC = Social Customer Relationship Management Capabilities; CRP = Customer Relationship Performance

AVE > MSV.
AVE > ASV.
It is seen from Table 2 that.
0.986671 > {0.02772, 0.042641, 0.173419} and
0.714738 > {0.02772, 0.142834, 0.119818} and
0.749631 > {0.042641, 0.142834, 0.703512} and
0.855889 > {0.173419, 0.119818, 0.703512}.

Cegarra-Navarro et al. (2016) observed that it is important to assess the discrimination validity to compare the square of the correlations among the variables with the AVE. Table 2 shows the square of correlations among different latent variables. It will help to confirm the discriminant validity. Wirtz et al. (2016) added that testing the factor loadings for each indicator helps to get a two-fold result for the convergent and discriminant validity both. The factor loading for any indicator should always be more than its constructs when compared with other factors.

Cross loadings are shown in Table 3. It includes factor loadings of the indicators, which are more than their constructs comparing with other factors. The value of the red cells in every row of Table 3 should be more than the other cells of the same row. This condition confirms the divergent validity.

For CRO1, 0.9866 > {0.030976, 0.046624, 0.168913} and
For CRO2, 0.986742 > {0.023745, 0.037545, 0.17329} and
For SMU1, 0.53156 > {0.001578, 0.077049, 0.015338} and
For SMU2, 0.859736 > {0.031766, 0.122122, -0.150665} and
For SCRMC1, 0.570522 > {0.050194, 0.145343, 0.540354} and
For SCRMC2, 0.870945 > {-0.012473, 0.110302, 0.628633} and
For SCRMC3, 0.121996 > {-0.094954, -0.159483, -0.71053} and
For SCRMC4, 0.776416 > {0.130899, 0.125381, 0.750261} and
For SCRMC5, 0.886804 > {-0.019179, -0.096823, 0.64445} and
For SCRMC6, 0.810901 > {-0.00188, 0.077145, 0.70523} and
For SCRMC7, 0.662697 > {0.053638, 0.003076, 0.658247} and
For SCRMC8, 0.722868 > {0.003081, -0.146486, 0.474074} and
For CRP1, 0.726161 > {0.194897, 0.11079, 0.656614} and
For CRP2, 0.872359 > {0.035171, -0.271159, 0.731392} and
For CRP3, 0.953581 > {0.209034, -0.129291, 0.841247} and
For CRP3, 0.953114 > {-0.20903, 0.175248, 0.821993}.

Table 3 confirms that the validity of this research is obtained to an acceptable level. Tables 2 and 3 shows that the divergent validity is also accepted for this research.

Tables 4, 5, and 6 help to perform a test of total effects. It is needed for all effects to be accepted, and the T-statistics must be greater than |1.96| (Salkind & Frey, 2021). The formula for calculating T-statistics is |Original Sample/Standard Error|. Table 4 shows that all values of T-statistics for this research are more than |1.96|, which confirms that all the effects are accepted for this particular research.

The test of total effects is shown in Tables 5 and 6. Ulrich et al. (2018) observed that values of R^2 for the three constructs for the research are 0.67, 0.33, and 0.19, which are considered comparatively as substantial, moderate, and weak.

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Table 4 Test of total effects

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	Standard Error (STERR)	T Statistics (|O/STERR|)
Customer Relationship Orientation − > Social CRM Capabilities	0.038711	0.026131	0.109734	0.109734	4.352775
Social media use − > Social CRM Capabilities	0.141761	0.053139	0.194107	0.194107	8.730325
Customer Relationship Orientation − > Social media use	0.02772	0.009774	0.136158	0.136158	9.203589
Social CRM Capabilities − > Social Relationship Performance	0.867695	0.430055	0.755501	0.755501	11.1485
Customer Relationship Orientation − > Social Relationship Performance	0.13642	0.133173	0.047738	0.047738	2.857642

Table 5 Test of total effects

	R square
Customer relationship orientation	
Social media use	0.340768
Social customer relationship management capabilities	0.421899
Customer relationship performance	0.7816

Table 6 Test of total effects

Total	SSO	SSE	$Q^2 = 1\text{-SSE/SSO}$
Social media use	472	270.899207	0.426061
Social customer relationship management capabilities	1888	1069.851936	0.433341
Customer relationship performance	708	291.033761	0.588935

Table 7 Test of Goodness of Fit (GOF)

	Communality
Customer relationship orientation	0.97352
Social media use	0.732546
Social customer relationship management capabilities	0.561947
Customer relationship performance	0.510851

$$R^2 \begin{cases} 0.19 \text{ Weak} \\ 0.33 \text{ Moderate} \\ 0.67 \text{ Substantial} \end{cases}$$

$$Q^2 \begin{cases} 0.02 \text{ Weak} \\ 0.15 \text{ Moderate} \\ 0.35 \text{ Substantial} \end{cases}$$

$$Q^2 = 1 - \text{SSE} / \text{SSO}$$

From Table 5, it can be said that the values of R^2 for Social Media Use and Customer Relationship Management Capabilities are moderate, and the value of R^2 for Customer Relationship Performance is Substantial. From Table 6, it is seen that all the values of Q^2 are substantial.

The test of Goodness of Fit (GOF) is shown in Table 7.

$$\text{GOF} \begin{cases} 0.01 \text{ Weak} \\ 0.25 \text{ Moderate} \\ 0.36 \text{ Substantial} \end{cases}$$

$$\begin{aligned} \text{GOF} &= \sqrt{\left[\{\text{Average } \left(R^2\right) \times \text{ Average (Community)}\}\right]} \\ &= \sqrt{[0.51 \times 0.69]} \\ &= 0.5952 > 0.36 \end{aligned}$$

GOF is accepted for this particular research.

11.3 Structural Model

The researcher has used Smart PLS Analysis software to analyze the collected data for this research. Al-Maroof et al. (2021) observed that the validity of the research could be assessed with the help of R^2s and structural paths. The path coefficients for this research should be positively essential to be at the level of 0.05.

From Fig. 2, it can be stated that the R^2 of social CRM capabilities is approximately 0.33% of the variance in social CRM capabilities, which is accounted for customer relationship orientation and social media use. Again, the R^2 of social media use is approximately 0.015% of the variance of social media use, which is accounted for the customer relationship orientation. The R^2 of the customer relationship performance is approximately 0.75% of the variance of customer relationship performance and accounted for the customer relationship orientation and social CRM capabilities. So, PLS analysis helps to understand the use of social media influences that customer relationship performance.

PLS analysis helps in performing hypotheses analysis. It is seen from the PLS analysis that customer relationship orientation has positive impacts on social CRM capabilities, which is 0.327. It can be said that H1 is supported, and the customer relationship orientation has positive impacts on social CRM capabilities. PLS analysis also shows that customer relationship orientation has positive effects on social media use, which is 0.124. This value ensures that H3 is supported and customer relationship orientation has a positive effect on social media use. Again, it is also seen that the use of social media sites has a positive effect on social CRM capabilities, which is 0.575. This value indicates that the use of social media has a powerful positive effect on social CRM capabilities. So, it ensures that H2 is supported, and increasing the

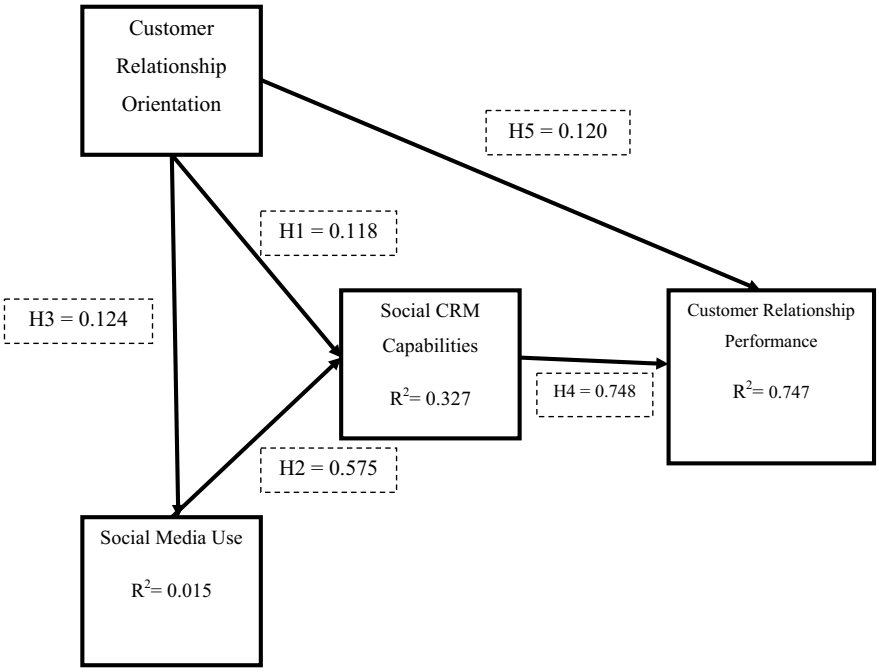

Fig. 2 Smart PLS analysis

use of social media helps to enhance the social CRM capabilities. Social CRM capabilities have a robust positive effect on customer relationship performance, which is 0.748. So, it is seen that H4 is supported. So, it can be said that ultimately, customer relationship orientation has a positive effect on customer relationship performance. Again, PLS analysis shows that customer relationship orientation has direct positive effects on customer relationship performance, which is 0.120. It proves that H5 is a supporter, and customer relationship performance is positively affected by customer relationship orientation.

12 Practical Implications

The availability of the internet has increased in recent years, which have a significant impact on the buying decision of the customer companies and the seller companies within a b2b business environment. Social media sites help to provide needed information about the products towards the buyer's small organizations. Social media sites help in making inter-connection between the buyer companies and the seller companies through online forums, communities, ratings, recommendations, etc. These changes have created a new era in the b2b business through e-commerce. E-commerce allows the buyer companies to rate the products they already bought or write reviews on that product. These ratings and reviews help other small business organizations in making their final buying decision. It helps to generate values towards both the buyer and the seller organizations. The researcher has used a technology acceptance model in this research, which has helped to present different constructs involved in this research. This research helps to understand the effects of social media in managing the customer relationships for the business organization with their small customer organizations within the b2b business environment through social CRM capabilities.

The researcher has used the PLS-SEM model as it helped to test the validity and reliability of this research. This statistical model shows that customer relationship orientation is directly related to customer relationship performance. It is also seen that customer relationship orientation affects social media use. Again, social media use affects social CRM capabilities, which affect customer relationship performance. So, it can be said that social media use has an impact on customer relationship performance through social CRM capabilities. The PLS-SEM model shows that social media use has an indirect influence on customer relationship performance. The users of different social media sites have power towards creating online content such as recommendations and reviews through various online communities. These recommendations and reviews have direct effects on the buying intentions of the other customers, which are the other small business organizations in the case of b2b business. The result of this research shows that the increased use of social media has a direct effect on social customer relationship management capabilities, and it affects the customer relationship performance of the big seller business organizations to maintain their small customer organizations. Customer relationship orientation has positive effects on social CRM capabilities. Social media use also has positive effects

on social CRM capabilities. Customer relationship orientation has positive impacts on social media use where social CRM capabilities have positive effects on customer relationship performance. It is seen from the PLS-SEM model that the positive effects of social media use on social CRM capabilities are convincing, which is 0.575, and the positive impacts of social CRM capabilities on customer relationship performance is also very strong which is 0.748. This proves that social media use has strong indirect positive impacts on customer relationship performance through social CRM capabilities.

The implications drawn by the researcher shows that it is needed to continue developing further social CRM capabilities by using the main two influential social media sites such as YouTube and Twitter. It will help not only to collect information but will also help to respond to this information. The seller organizations should focus on social analytics, live feeds, photo sharing, etc. as it will help to increase social CRM capabilities. The seller organizations should make more investment on social media sites as a CRM tool as it has positive impacts on customer relationship performance. The researcher has suggested for performing further research on the reason why YouTube plays the role of intermediary among social CRM capabilities and customer relationship orientation and their impacts. Future research should test the conceptual model with a larger sample size towards minimizing the research limitations.

Proper research ethics is maintained by the researcher while performing this research. The researcher promised the sample group of companies that the primary data collected from them will be used only for this research and will not be published anywhere else. The researcher maintained the privacy of these companies in an ethical manner. The quantitative questionnaire set by the researcher in this way so that they do not create any harmful effects on these companies. The researcher has maintained the code of ethics while performing this research.

13 Conclusion

It is seen from this research that most of the business organizations involved in the b2b business do not understand the full value of using social media. Most of them still use social media as their marketing tool, and they do not realize that social media can be used for improving customer relationships. So, their customer relationship performances do not improve. It is also seen that some of the companies realized the full value of social media as a relationship tool, but they are in very early stages towards developing their social media strategies. These companies did not even develop the needed social customer relationship management capabilities so that they can attain a higher customer relationship performance.

In conclusion, it can be said that the companies that are customer relationship-oriented, should use social media towards improving their customer relationship performance through developing social CRM capabilities. More and useful use of YouTube and Twitter may help the seller companies involved in the b2b business

environment to develop more improved social CRM capabilities, and it may help these organizations to obtain a higher level of customer relationship performance.

Limitation and recommendations for future studies

Limitations of the research indicate that there are future scopes of the study. This researcher helps to understand the effects of social media in managing customer relationships for the seller business organizations within the b2b business environment. The research result shows that the use of social media has a strong positive impact on customer relationship performance. Though it is also seen that most of the companies do not realize that Social media can be used as a relationship tool, and they only utilize social media as their marketing tool. This research highlights that social media is a tool to make a quick response to their customers. Social media allows companies to engage with their customers. It helps to make a conversation with the customers. It helps the companies to ask their customer companies to provide feedback and also thank them for their valuable time to write the feedback. Social media helps the seller companies to provide personal touch towards their customer companies. Providing rewards towards customer companies through social media sites can be a way towards making an active community. Different contests and competitions through social media sites help the seller organizations to know more about their customer companies. Social media sites can be used by the seller organizations to provide their customer companies various promotional offers, sales, or coupons. Social media sites also help the seller organizations to find out their unhappy customers and the reasons for their unhappiness. It will help them to improve their services. The seller organizations should follow User-generated content (UGC) as it will inform the followers of that company that the ideas and views of the followers are taken into account towards building the brand. It will help to customer relationship performance of the seller organizations.

Like every other research, there are many limitations faced by the researcher while performing this research. One of the most critical limitations faced by the researcher at the time of performing quantitative research was that the sample size was too small. So that it was hard to find any particular conclusion as the research findings could be taken in any direction. The sample size should be increased to get a perfect research result. The small sample size influenced the validity, quality, and reliability of this research. More data should be collected to address the validity of the research. Another limitation faced by the researcher was that some customers were contacted partially by the companies on behalf of the researcher. This may provide incomplete information as in this case, and the companies selected the customers whom they were comfortable to contact with. It may create a systematic error in the sample. Another limitation was that the companies always do not provide the correct information for maintaining the privacy of their companies. This may generate changes in the research result. The limited-time period was another major limitation of this research. Again, another critical limitation was limited financial support. If the researcher would get more time and needed financial support, then the research would be more productive and specific with more required data.

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An Empirical Study Investigating the Role of Team Support in Digital Platforms and Social Media Marketing Towards Consumer Brand Awareness: A Case of the United Arab Emirates

Mohammed T. Nuseir, Abu Reza Mohammad Islam, Sarah Urabi, Muhammad Alshurideh, and Barween Al Kurdi

Abstract The advent of social media marketing and team support for innovation is considered simultaneously as the two main antecedents of consumer brand awareness. To support this assertion, this study explored the consequences of support by marketing team members toward innovative approaches to social media marketing. The study randomly selected 247 participants from the United Arab Emirates. Data were analyzed using multiple linear regression. Results showed that both social media marketing and team support for innovation were positively associated with consumer brand awareness in that social media marketing and team support played as catalysts reinforcing brand awareness. In addition, the team support for innovation was positively associated with social media marketing; alternatively, they complement each other towards brand awareness.

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_6

Keywords Brand awareness · Social media platforms · Digital marketing · Social media marketing · Innovation · Team support for innovation

1 Introduction

There is a high prevalence that consumers now a day spend extraordinarily a higher amount of time on digital platforms, an unprecedented rate of engagement with the brands that they usually support and advocate for (Alshurideh et al., 2019a, 2019b; Aljumah et al., 2021a, 2021; Kurdi et al., 2021). In the past, any brand wanting to connect with prospects of finding an avenue, the usual tendency was either to make an advertisement in the paper or invest in billboard (Alshurideh et al., 2017; Abuhashesh et al., 2021a, 2021b; Al Kurdi et al., 2021). Nowadays, customers make an intensive usbe of digital media to find brands (Abu Sweiss et al., 2021; Zayyad et al., 2021). Consequently, there has been on a plethora of dynamic change in momentum shifting the exclusive control from the brand itself to the consumers. Further, the advent of the internet and explosion of digital technology has brought about major changes in the world of consumer behavior due to the massive application of websites, blogs, reviews, testimonials, and other forms of online content. All these avenues have strengthened consumers to conduct research on anything about any product, service, or any brand enabling them to decide upon their purchases. Consequently, consumers expect the brands to have their digital presence and communication with brands through the digital channels. This necessitates the cultivation of a digital brand through a digital-first approach. Then consumers would expect the brands to be responsive on digital platforms; a bad customer experience, however, means when the majority do not get any response after reaching out to a brand on a social network. In some instances, customers when using social platforms like Facebook to reach out to them for satisfaction or resolution with a problem, and do not get responses as quickly as they would like to, half of them would hardly conduct business with the company again.

Social media as platforms for marketing are gaining substantial attention from the public as well as from researchers. Marketing practitioners have been continuously and consistently amazed by the power of social media (Lipsman et al., 2012). Research has suggested that the major benefits of using social media platforms for marketing is that they provide a very convenient vehicle for developing consumer brand awareness in the target market (Hanna et al., 2011; Berthon et al., 2012).

Social media platforms have become a major part of the daily lives of many people now a day, and this has been increasingly so over the years. A single post by a brand on these platforms can, therefore, reach to a much larger proportion of the population compared to other marketing channels (Michaelidou et al., 2011). Many previous studies focused on the variables of brand awareness and social media marketing (Thackeray et al., 2008; Lipsman et al., 2012; Berthon et al., 2012), but those studies did not examine the concept of innovation and the crucial need for team

members supporting the innovative approaches to marketing, and the social media marketing per se.

Given the above backdrop, the present study has identified and aimed at filling this gap by investigating the role of team member supports for engendering the innovative approaches when using the social media platforms to create the consumer brand awareness in society (Nuseir et al., 2021a, 2021b; Al-Dhuhouri et al., 2020; Alshurideh et al., 2022).

In the following three sections, we discuss relevant important variables and issues considered in this study and their relationships with the study objectives.

1.1 Consumer Brand Awareness

The concept of consumer brand awareness is one of the most crucial dimensions of branding (Hamadneh et al., 2021; Keller, 2001). As explained by Keller (1993), brand awareness is the ability of a consumer to recall a brand and to center their buying decisions based on this memory. Considering the possible impact of brand awareness on brand choice (Elsaadani, 2020; Hays et al., 2013) and the intentions of consumers making the final purchases (Alshurideh et al., 2015; Hutter et al., 2013), this particular concept and issue have been treated with much importance in the marketing domain as well as in the literature.

Importance of a brand: Research has shown that consumers are relatively more confident about purchasing the brands readily that they are aware of (Low & Lamb Jr., 2000; Homburg et al., 2010). When consumers deal with unknown brands, they resort to making comparisons with known brands in terms of characteristics such as, product packaging, product quality, and price (Dick et al., 1997). Considering the kind of competition that exists in the present-day business sector, brands are competing with each other intensely than ever before. It is therefore, imperative and very important for companies to use the most effective technique (s) to maintain their brand portfolios in order to retain their respective positions in the industry (Cobb-Walgren et al., 1995; Malik et al., 2013; Nguyen et al., 2018). Other factors such as population demographics (Matherly et al., 2018) and the design and content of advertising efforts, can also have a great impact on brand equity (Aljumah et al., 2021a, 2021b, 2021c; Guitart et al., 2018).

1.2 The Concept of Digital Marketing

Within the field of marketing, digital marketing has increased in popularity lately, which led to have increased its importance (Hutter et al., 2013; Khasawneh et al., 2021a, 2021b) in social media. As a result, other marketing media such as print

advertising, television advertising and outdoor advertising, all have lost their popularity and importance across industries and business sectors alike (Al-Dmour et al., 2014; Al-Maroof et al., 2021; Bruhn et al., 2012).

Another important factor or determinant that has created an impact on the shift in marketing media is economic pressure (Kirtiş & Karahan, 2011). It is no wonder that the increase in advertising costs has put limitations on many companies on the classical style of marketing ventures. This has led most companies with a large majority of brands developing their preference for digital/online media marketing, as they are found to be less expensive potentially and thus, providing the managers across companies with the ability and control to manage their advertising budgets rather more effectively and efficiently (Hoffman & Fodor, 2010; Kirtiş & Karahan, 2011; Almazrouei et al., 2020).

1.3 The Concept of Team Support for Innovation

In the business world, innovation refers to the introduction of novel and improved ways of carrying out an activity in the workplace (Alameeri et al., 2021; Martins & Terblanche, 2003). Research has shown that an open approach to innovation can lead to more creative solutions (Al Suwaidi et al., 2020; Ghannajeh et al., 2015; Hakansson & Waluszewski, 2007) and better work outcomes (Autio et al., 2014; Obeidat et al., 2021). Team members who are supportive of such work behaviors are open to change, and are, therefore, more likely to succeed in (Enkel et al., 2009; Almaazmi et al., 2021).

With each passing day, social media platforms are improving their functionality, with new and improved features added at a regular interval (Shankar et al., 2011). Professionals working in the marketing fields are therefore, encouraged to be open in creative ideas, thinking and innovation. In addition, it is advised that the marketing departments must demonstrate the attitude towards innovative ideas and actions specifically, by their team members (Al Naqbia et al., 2020; Dodgson, Gann, & Phillips, 2013; Enkel et al., 2009; Georgellis et al., 2000).

2 Literature Review

Now a day, marketing activities through platforms like, Twitter, Facebook, and Instagram have become immensely popular among the public. This has brought about a significant shift in marketing practices (Shankar et al., 2011, Nuseir et al., 2021a, 2021b). Marketing professionals have new opportunities in the form of digital marketing (Mangold & Faulds, 2009). These social media platforms not only help in the marketing of products, but also help companies to gain necessary insights into the needs of consumers through their feedback more often than otherwise (Hansen et al., 2018; Rapp et al., 2013). Eventually, this new insight is capitalized to help

assist in designing effective marketing and advertising strategies in the modern-day marketing. Consequently, such information is used further to improve products at regular intervals, helping the product development and diversification across industries (Mount & Martinez, 2014; Rapp et al., 2013).

However, within the classical form of marketing and advertising efforts, any rapid changes usually take some time to be operative. For instance, the in-stream advertisements and Facebook stories are a relatively new phenomenon. Because of severe competition among different social media platforms, once a feature is introduced by one platform, it is often adopted later by other platforms (Mangold & Faulds, 2009). This requires the team members of the marketing department (especially, in digital platforms) with high readiness and alert to be flexible enough in approaching the pragmatic and competitive marketing technique (s) that they must apply or adhere to. However, the failure to follow suit the commensurate marketing technique (s) in time required to sustain the current dynamic environment or otherwise rigidity can create hindrances that may lead to negative consequences for the businesses (Alshurideh et al., 2016; Antikainen et al., 2010). Therefore, one would expect the benefits of using a flexible approach with better results, as it always encourages positive changes than resisting them (; Enkel et al., 2009).

Team innovation is considered therefore, the backbone of every successful company helping it to grow and prosper, setting the business apart from the competition for a while. In this process, the team members feel themselves connected to the company with the motivation and incentives to be creative and innovative. The members, therefore, consider themselves to be in the loop on a firm's strategies and challenges inviting their input. Team members involved early in the processes and plans of the company business would like to see them through to completion—their active participation helps hitherto in fueling more innovative ideas and ventures towards branding a product or service.

Research has shown that teams that are supportive of each other's novel ideas and creativity are more open to learning new things (Martins & Terblanche, 2003). Such teams are better able to produce innovative solutions, which in long run perspective, would help assist the brand or company in gaining a competitive edge in the market making of the brand to be more successful (Alameeri et al., 2020; Evans, 2010; Mount & Martinez, 2014).

2.1 Conceptual Framework

Figure 1 depicts the conceptual framework used for this study. This framework shows two antecedents of consumer brand awareness. It also reflects the consequences of a supportive approach of team members for innovation in the practice of social media marketing.

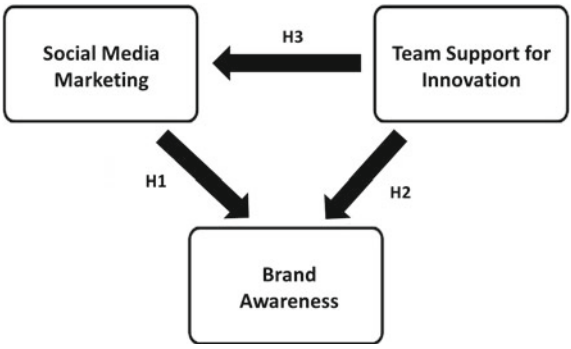

Fig. 1 Conceptual framework

3 Research Hypotheses

3.1 Hypotheses Related to the Antecedents of Consumer Brand Awareness

3.1.1 Social Media Marketing

The online platforms of social media were developed according to the basic principles of communication. These channels of communication encourage the flow of information among the users, which in turn, leads to the development of relationships (Alshurideh, 2022; Homburg et al., 2010) and collaboration among the people living in different locations all over the world (Michaelidou et al., 2011). Therefore, when marketing professionals use these platforms for marketing their products, they create healthy and unrestricted channels of communication.

The posts and the marketing content created and shared by companies often go viral. Consequently, this leads to millions of views in a very short span of time (Hoffman & Fodor, 2010; Scott, 2015). In the end, this high exposure ultimately helps to create brand awareness even beyond the target market at which the advertisement was initially meant and aimed for (Marchand et al., 2017; Mount & Martinez, 2014). Social media platforms have not only shown their power at the business-to-consumer (B2C) level (Moore et al., 2013), but in some cases, they have also helped to increase the level of profits at the business-to-business (B2B) level (Michaelidou et al., 2011). Such objectives are mainly achieved by delivering information about the products and services to the general public, which eventually, helps to create a higher level of brand awareness (Hays et al., 2013; Klostermann et al., 2018). In this regard, research has also shown that the loyal consumers also contribute to brand awareness by engaging themselves in electronic word-of-mouth (e-WOM) (Eelen et al., 2017).

Given the discussions above, we investigated the association between the social media marketing and consumer brand awareness; the first research hypothesis (H1) was proposed as follows.

H1. *Social media marketing is positively associated with consumer brand awareness.*

3.1.2 Team Support for Innovation

Once innovations and brands that companies adopted to continue in the market, the usage of Internet and Digital marketing have been very common (Alzoubi et al., 2022; Mount & Martinez, 2014). Companies that usually do not adapt to the changing trends or fail to adhere are found to be to lose out of the competition (Roberts & Piller, 2016). Management's support for creativity and innovation is regarded to be a highly essential component of marketing success (Bassett-Jones, 2005; Dodgson, Gann, & Phillips, 2013; Roberts & Piller, 2016). According to Wu and Ho (2014), even the perception of brand innovation among consumers can have a stronger impact on the level of brand awareness, perceived product quality, and purchase intentions among them.

Given the above backdrop, we investigated the association between team support for innovation and consumer brand awareness, and as such, a second hypothesis (H2) was proposed as below.

H2. *Team support for innovation is positively associated with consumer brand awareness.*

3.2 Hypothesis Related to the Consequences of Team Support for Innovation

Social media marketing has become a common practice, with almost all companies, large and small, invariably; use these media for marketing and advertising purposes (Gallaugher & Ransbotham, 2010). In a time of severe competition, brands and companies need to be differentiated from one another (Dodgson et al., 2013). One can achieve this objective only by ensuring that the social media marketing campaigns developed by brands are innovative (Shankar et al., 2011).

One major benefit of social media marketing is that people from outside the workforce such as, consumers can also be involved in the process, allowing the workforce to gain required insights into more creative marketing options (Scott, 2015). However, the team members of the marketing department must be capable enough of identifying such creative and innovative opportunities from the marketing team members as well as from outside the workforce (Antikainen et al., 2010).

Therefore, we studied the consequences of team support for innovation in terms of the use of social media marketing tools with the third study hypothesis (H3) proposed as follows.

H3. *Team support for innovation is positively associated with social media marketing.*

4 Data Collection and Analysis

4.1 Participants

Data were collected from a sample of 247 participants who were randomly selected from the United Arab Emirates. To qualify for the study, a basic understanding of social media platforms was required. To simplify data collection, the researcher used online media to send the questionnaires to participants. This also enabled the automatic recording of information.

Since social media, platforms are very popular and are commonly used by people irrespective of ages, ethnicities, and nationalities, no candidates were disqualified based on age and above selection criterion. It is worth pointing that more than 50% of participants were between 21 and 26 years old. The sample had relatively more male than female participants did (males: 138, 55.9%, females: 109, 44.1%).

4.2 Measures and Procedures

A survey approach was used to collect quantitative data. To measure the variable "social media marketing" (SMM), a 5-item scale was adapted from Bambauer-Sachse & Mangold. To measure the level of "consumer brand awareness" (CBA), the scale developed by Yoo et al. (2000) was adapted according to the requirements of this study. For the variable "team support for innovation", (TSI) and this scale also had five items. The scale developed by Anderson and West (1998) was adapted to measure "team support for innovation" (TSI), which included eight items in total.

The first section of the questionnaire (Appendix A) was related to demographic information; the second section included the scales designed to measure the three variables of interests. In answering the questions, respondents used a 5-point Likert scale; response options ranged from 1 = Strongly Disagree to 5 = Strongly Agree.

To check the reliability of the study constructs, the statistical technique of Chronbach's alpha was used. The alpha values for the scales of SMM, CBA, and TSI were 0.781, 0.794, and 0.860, respectively (Table 1). All of these values were higher than 0.70, which was believed to be the cut-off point for the reliability of any scale (Nunnally & Bernstein, 1994).

Table 1 Reliability testing of scales

Scale	N	Chronbach's Alpha	Source
Social media marketing (SMM)	5	0.781	Bambauer-Sachse and Mangold
Consumer brand awareness (CBA)	5	0.794	Yoo et al. (2000)
Team support for innovation (TSI)	8	0.860	Anderson and West (1998)

5 Findings and Discussion

To test the three proposed hypotheses of this study and to find out the impact of three determinants precisely on consumer brand awareness (CBA), we performed a regression analysis (both simple linear and multiple regressions) by using SPSS. Using the multiple linear regression analysis, a strongly positive correlation was found between the dependent variable, CBA, with each of the independent variables, TSI, and SMM ($R = 0.733$). A significant, positive impact was also found of the independent variables (TSI and SMM) on CBA ($R^2 = 0.537$, $p < 0.05$) (Table 2).

Our findings support the first and second hypotheses of the study, in that the study results supported the assertion that SMM and TSI were positively associated with CBA. The estimated regression equation was found to be as follows.

CBA = 0.298 + 0.343 (TSI) + 0.516 (SMM).

Previous studies also showed a positive impact of the use of digital and social media marketing on consumer brand awareness (Hanna et al., 2011; Berthon et al., 2012; Bruhn et al., 2012; Hutter et al., 2013). Lipsman et al. (2012) were of the view that the social media tools held lots of power, and therefore, be considered as essential media for marketing purposes.

Support for the second hypothesis of the study was also in line with those of previous studies, demonstrating also a positive impact of team support for innovation on consumer brand awareness (Antikainen et al., 2010; Enkel et al., 2009; Evans, 2010; Mount & Martinez, 2014). Marketing teams were more likely to bring more creative solutions with a high rate of success, provided they encouraged innovative ideas offered by other team members (Autio et al., 2014; Enkel et al., 2009; Hakansson & Waluszewski, 2007).

Using simple linear regression analysis, a medium positive correlation was observed between TSI and SMM ($R = 0.601$). In addition, a statistically significant positive impact of TSI was also observed for SMM ($R^2 = 0.362$; $p < 0.05$). (See Table 3).

H3 of the study was, therefore, supported. The estimated regression equation drawn from the study is:

SMM = 1.257 + 0.669 (TSI).

Table 2 Multiple regression analysis for Hypothesis 1 and Hypothesis 2

Variable	B	SE	t	Significance
Constant	0.298	0.235	1.269	0.206
Team support for innovation	0.343	0.054	6.368	0.000
Social media marketing	0.516	0.060	8.607	0.000
Dependent variable	CBA			
R	0.733			
R^2	0.537			
F (Significance)	141.420 (0.000)			

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Table 3 Linear regression analysis for Hypothesis 3

Variable	B	SE	t	Significance
Constant	1.257	0.266	4.722	0.000
Team support for innovation	0.669	0.057	11.782	0.000
Dependent variable	SMM			
R	0.601			
R^2	0.362			
F (Significance)	138.806 (0.000)			

The study result is in line with the previous research work in the literature suggesting that the team support for innovation was positively associated with the effectiveness of the tools and techniques of social media marketing (Dodgson et al., 2013; Enkel et al., 2009; Georgellis et al., 2000). Further, using innovative techniques and content ideas for social media marketing, we were able to observe a precipitative impact of generating competitive advantage. The use of such creative ideas, however, might also lead to a higher chance of media posts "going viral," which could lead to greater exposure and hence, a higher level of brand awareness among the potential, as well as existing consumers.

6 Limitations

Even though this study provided some interesting results, it has one main limitation. The inclusion criteria for this study were very broad, as people from different functional backgrounds were included. Considering the nature of variables examined in this study, more relevant findings could have been obtained, had the research focused only on marketing professionals working in the United Arab Emirates. The current participants might have responded to the questionnaire statements, based on their assumptions only, rather than on strong academic knowledge or some other practical experiences in the field of marketing.

7 Conclusion

The purpose of this study was to investigate the role of social media marketing, and team support for innovation, as the two main antecedents of consumer brand awareness. The study also explored the impact of a supportive approach of team members on innovation concerning the techniques of social media marketing. After the analysis of the data, we found that social media marketing and team support for innovation were positively associated with consumer brand awareness. In addition,

we found that team support for innovation was positively associated with the effectiveness of social media marketing. All the three hypotheses proposed in this study were verified and supported in line with those of the previous research studies in the field.

8 Implications and Directions for Future Research

8.1 Practical Implications

We recommend that marketing professionals should make use of the different tools and techniques of social media marketing in order to create greater brand awareness. Social media platforms were widely used and had large audiences, and that led the messages posted on these media, reach more likely relatively to a larger section of population. It is asserted that, an open culture needs to be nourished and cherished within the companies' providing supports and encouragement, especially for the entrepreneurial and innovative approaches of marketing team members. Social media platforms require an upgrade at regular intervals; marketing professionals should also keep abreast of new developments when designing the marketing strategies and applying them.

8.2 Opportunities for Future Research

In order to improve the quality of data when studying the variables of social media marketing, the team support for innovation, and consumer brand awareness, we recommend the recruitment of only the professionals from the marketing domain. In addition, we suggest a case study approach on a particular brand type to be adopted for a clearer vision. Besides, comparisons between two or more companies developing different brands of a product could be made concerning their respective organizational structure (s) and other cultural characteristics.

Appendix A: Questionnaire

Demographic information

Gender

- Male
- Female

Age

- 20 years or under
- 21–26 years
- 27–33 years
- 34–40 years
- 41–46 years
- 47–53 years
- 54 years or above

Education

- Below high school
- High school
- Diploma
- Associate degree
- Bachelor's degree
- Master's degree
- Postgraduate

Monthly income

- Less than 1,000 AED
- 1,000 AED–8,999 AED
- 9,000 AED–16,999 AED
- 17,000 AED–24,999 AED
- 25,000 AED–32,999 AED
- 33,000 AED–40,999 AED
- 41,000 AED–48,999 AED
- 49,000 AED–56,999 AED
- More than 57,000 AED

Do you use social media for marking and advertising?

- Yes
- No

If yes, which of the following social media do you use for marking and advertising? (Select as many as apply.)

- Facebook
- Twitter
- Instagram
- YouTube
- All of the above

Which ONE of the following is your most preferred medium of social media for marking and advertising? (Please select one only.)

- Facebook

- Instagram
- Snapchat
- YouTube
- Other (Specify): _____

Instructions: For each of the statements given below, please signify your level of agreement or disagreement by marking any one of the options provided: Strongly Disagree (SD), Disagree (D), Neutral (N), Agree (A), or Strongly Agree (SA).

Level of agreement		SD	D	N	A	SA
Social media marketing statements (*Adapted from* Bambauer-Sachse & Mangold, 2011)						
1	To make sure that they are buying the right products and/or services, consumers often read other consumers' online product reviews					
2	Our consumers can read others' online product reviews to know what products and/or services our company/brand offers					
3	Consumers often consult other consumers' online product reviews to help choose the right product/brand					
4	Consumers frequently gather information from online consumers' product reviews before they buy a certain product and/or service					
5	If consumers do not read others' online reviews before buying a product/brand, they worry about their decisions					
Consumer brand awareness (*Adapted from* Yoo et al., 2000)						
6	Consumers are aware of most of the products and/or services offered by our company/brand					
7	Consumers can easily recognize the products and/or services offered by our company/brand					
8	Consumers can easily recognize the logo of our company/brand					
9	Consumers are aware of the quality of products and/or services offered by our company/brand					
10	Consumers can tell the difference between products and/or services of our company/brand and those of others					
Team support for innovation (*Adapted from* Anderson & West, 1998)						
11	My team is always moving toward the development of new answers					
12	Assistance in developing new ideas is readily available					
13	My team is open and responsive to change					
14	People on my team are always searching for fresh and new ways of looking at problems					
15	On my team, we have the time needed to develop new ideas					
16	People on my team cooperate in order to help develop and apply new ideas					

(continued)

(continued)

Level of agreement		SD	D	N	A	SA
17	Members of my team provide and share resources to help in the application of new ideas					
18	My team members provide practical support for new ideas and their applications					

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The Influence of Sharing Fake News, Self-Regulation, Cyber Bullying on Social Media Fatigue During COVID-19 Work Technology Conflict as Mediator Role

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Abstract The purpose of this paper is to analyze the impact of Sharing Fake news, self-regulation, Cyber Bullying on social media fatigue during COVID-19 work technology conflict as mediator role. The current study uses quantitative with cross sectional design to examine the effect of Sharing Fake news, self-regulation, Cyber Bullying on social media fatigue during COVID-19 and suing work technology conflict as mediator role. The respondents were situation from different top sites, such as twitter, Facebook and Instagram sample of 132, and population of this study is 200 users were selected for this study, sample size is calculated through ROA soft. The dissemination of unverified information has been showcased as a significant challenge during the COVID-19 pandemic. The role of social media in this process is exemplified by its increased use during COVID-19, as, for example, a recent report

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_7

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shows that the use of Facebook hit record levels during the pandemic. This study revealed that potential mechanisms for counteracting fake news creating Facebook pages of real news and using this advertising to disseminate accurate information this paper will enhanced the understanding the effects of SMA, cyberbullying and self-regulation on mental health of individual through the use of social cognitive perspectives. To enhance efficacy in the role of social media in this process to reduce the gap between theory and practice, social marketers should include messages that empower recipients. Campaigns should show recommended behaviors and highlight their usefulness and effectiveness. This paper has been methodological as well as theoretical limitations, first using CLT might be regarded limiting even through it has been adopted in past studies that are based on social media. The primary concern is the cognitive load theory is still essential an instructional science theory even through it has been adopted, use widely in HCI & also shown to explain not only learning but also acquiring knowledge from new theories, articles might be more useful for conceptualizing fake news sharing.

Keywords Sharing fake news · Self-regulation · Cyber bullying · Social media · Social media fatigue · COVID-19

1 Introduction

Internet has powerful changed the type of news that customers receive (Alshurideh et al., 2016; Obeidat et al., 2012). In past times, consumers were basically relied on traditional type of media such as television and radio, which cover comparatively more and fever established sources of news (Alshurideh et al., 2019a; Obeidat et al., 2019; Zayyad et al., 2021), but currently consumers are reveal to online information sources through social networking sites, which allow any person to share content without "fact-checking or editorial judgement (Al-Dmour et al., 2014; Liu et al., 2021). Whereas social media enables firms to introduce creative and useful practices of management by introducing new models of business, communication reshaping, collaboration enhancing and seeking improve and shared knowledge (Almazrouei et al., 2020; Khan et al., 2021; Kurdi et al., 2021). The circulation of fake news sharing was significantly posing challenge for organization and brands fake news promote a specific option about brand, product or firm which may not be true can be intentionally designed to mislead customers. Social media is the term that enables users to connect with others (Hamadneh et al., 2021; Khasawneh et al., 2021a, 2021b). Past studies revealed that it can provide platforms to individuals that overcome the obstacles of time and distance to connect and reconnect with others and thereby increase the strength their offline networks and exchanges (Alshurideh et al., 2019b; Bekalu et al., 2019).

Social media platforms such as Facebook describe as several driven motivators such as wish for entertainments, stay informed and the desire to know the social activities of mutual users (friends) (Abuhashesh et al., 2021; Al Kurdi et al., 2021;

Laato et al., 2020). Social media basically plays a significant role during COVID as it enables individuals to share news as well as personal viewpoints and experiences with one another globally and in real-time (Aljumah et al., 2021a, 2021b; Al-Maroof et al., 2021). The issue of social media regulation platform has always been a controversial one for many in large society. The traditional method of media regulation is that there are relatively small number of users who produce the media coupled with a large number of those who consume it and powerless to directly influence the content (Zabedah & Kosmin, 2012). Regulatory actions is a social media is often focused upon disclosure of interest, children protection, code practices and offensive material prohibition (Ranchordás & Goanta, 2019). Almost every country in the world facing the COVID-19 situation during this time social media become the main information sources about pandemic (Akour et al., 2021; Al-Dmour et al., 2021a; Alshurideh et al., 2021; Leo et al., 2021).

2 Problem Statement

The abundance of uncertain, inaccurate information during existing situation led to overload information and accelerated health cyberchondria as well as misinformation sharing as social media intensity the spread of news and people read that news through shared link on social websites (Allcott & Gentzkow, 2017). The specific concern of fake news effects 2016 US election and about 62% US adults get news on social media and mostly fake news were widely shared on Facebook and become most popular mainstream of fake stories fortunately many people who see those fake news reported that they believe fake news arises because it is cheaper to provide precise signals as the consumer cannot causelessly infer accuracy and also because consumers enjoy partisan news (Chiou, 2018). However, internet has significant modification type of news that consumer acquired. Nowadays, consumers are revealing to online information sources for example social media sites which allow any person to share content without "fact-checking or editorial judgement" (Allcott & Gentzkow, 2017).

About two third adult's use Facebook, 16% adult's uses twitter and 20% users uses Instagram critics allege that most of fake new traffic were originates from these websites and that referrals account for a huge fraction of fake news sites than real news sites (Meinert et al., 2018) on the other hand cyberbullying is characterized as online communication it has negative effect on mental health with 32% victims reporting symptoms of stress and 38% were experiencing emotional distress (Das, 2020). This study examines the impact of fake news, self-regulation and cyberbullying factors on social media during the current situation of pandemic particularly people driven by entertainment and do not seem equally concerned about the information reliability they share on social media and investigate strategies with aim to reduce these factors on social media.

3 Literature Review

For the existing study, we adopt the affordance lens for understanding how users of social media connects with different platforms during pandemic situation. In this section, the author will present both theoretical & empirical approaches in order to connect them to the topic of this study.

3.1 Cognitive Load Theory

Cognitive load theory was developed in the late 1980s, it refers to use the amount of work memory resources in which information is stored in long-term after being attended to the experience of cognitive load is not same in everyone this theory differentiates three types of cognitive load i.e. germane, extraneous and intrinsic (Chong, 2005). The extraneous load has been investigated more often and in the boarder approach of human-capital interaction HCI, indicate to the environmental stimuli in which human brain reacts. Intrinsic cognitive load on the other hand is the load resulting from processing this information and is affected by individual's psychological state of mind as well as their prior knowledge (Sweller, 2010). Accordingly, well-structured information and earlier expertise of the learner can both decreases intrinsic cognitive load. The evolutionary still affects the behavior of human and it play especially acquiring new knowledge also referred as the human comfort zone. Vygotsky proximal zone development and CLT overload information can be conceptualized to occur when individual are overcome with further novel information or are taken too far away from their comfort zone. Consequently, overload information leads to impulses to step from new knowledge, back to the zone of proximal establishment.

4 Conceptual Framework

The proposed conceptual framework of this particular research study based on three independent variables which include sharing of fake news, cyberbullying, self-regulation. On the other hand, this study contains one dependent variable which is social media fatigue (SMF) COVID-19. The given below Fig. 1 shows the conceptual framework of this research study:

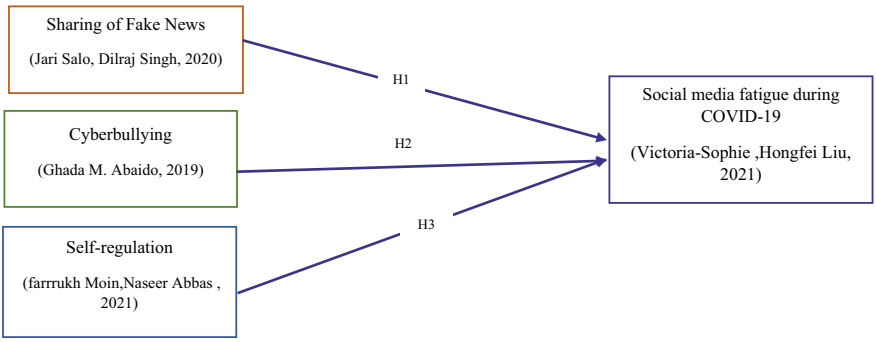

Fig. 1 Conceptual framework

5 Hypothesis Development

5.1 Sharing of Fake News and Social Media Fatigue During COVID-19

According to Nuseir et al. (2021), Social media fatigue (SMF) refers the tendency of users to pull back from social media when they become overwhelmed with too many social media sites. The term fatigue relates to overload cognitive however it reduces the concept of fatigue to the two components information and communication overload scholars argues that social media fatigue has significant negative implications for both service operators and the businesses (Yoo & Zhang, 2020). Social media fatigue can be detrimental for both business and service operator because fatigue results in withdrawal from service use, which translates into lower profits for companies and service operators (Aljumah et al., 2021a, 2021b, 2021c) (Dhir et al., 2018).

SMF is described as "social media users" aptitude to slow down social media usage when they feel overwhelmed with too many content pieces, friends and so much time consumed keeping these contacts (Cao, 2018).The supporting theory has been used to look how social media characteristics give rises to stressors, such as privacy invasion and life invasion, which then lead to SMF (Adhikari & Panda, 2020).

H1: Sharing of fake news is positively related to social media fatigue during COVID-19.

5.2 Cyberbullying and Social Media Fatigue During COVID-19

Cyber bullying take place over digital devices such as computers, cell phones and tablets it includes sharing, posting or sending negative or false mean content about someone else. The concept of cyber bullying that separate it from traditional bullying.

Conventionally, the consequences of cyberbullying about half of the teenagers have reporting being the victims of cyberbullying It take places in cyberspace through several medium including comments on someone post, online chats and others and it is one of the big problems on social media websites like Instagram, Facebook (Al-Dmour et al., 2021b; Elsaadani, 2020a, 2020b; Sweiss et al., 2021; Vartak et al., 2000).

H2: Cyberbullying is positively related to social media fatigue during COVID-19.

5.3 Self-regulation and Social Media Fatigue During COVID-19

Self-regulation is referred to as the process of turning goals into actions it defined the process of self-generated thoughts, feelings and behaviors are periodically and planned. Individuals suffer from DS-R trouble regulating their actions such as they are more susceptible to acting based on impulses rather than planned cognition and behavior it is connected to sub-optimal and irresponsible behavior and reduced psychological well-being and internet addiction (Al-Khayyal et al., 2021; Matzat & Vrieling, 2016; Sultan et al., 2021).

H3: Self-regulation is positively related to social media fatigue during COVID-19.

The knowledge gap of this study is that these variables are not study in this sequence with social media fatigue during COVID-19 with mediating variable of work technology conflict, in future authors can also examine mediating variable like fear of mission out (FOMO). However, the variables are adopted from different papers furthermore, this study is not previous done in Pakistani context thus this paper fill the gap to study these variables in Pakistan using different social media websites to examine how these variables effects human behaviors and social media.

6 Methodology

This paper is quantitive in nature, and data is collected from a survey questionnaire. The questionnaire is divided into two parts one part is demographics such as income, age, gender, monthly income, and next part include variables questions as seen in the appendix Table 1. The research design will used in study is cross-sectional & deductive approach will be used as the following study is based on preexisting theories and hypothesis in order to identify the association between independent and dependent variable. We used different website such as twitter, Instagram, Facebook to determine how fake news, cyberbullying and regulating predicator's effects social media during COVID-19 Non-Probability will be used in further chapters and examine the regression, descriptive through SMARTPLS.

Table 1 Cronbach Alpha values for the study factors

Constructs	Sources	Items	Cronbach Alpha
Sharing of fake news	Jari et al.	4	0.857
Self-regulation	Moin and Abbas	4	0.785
Cyberbullying	Abaido (2019)	4	0.866
Social Media Fatigue	Victoria-Sophie and Liu	4	0.879

6.1 Respondents Profile

The survey method helped to determine the impact of social media fatigue during current situation from different top sites, such as twitter, Facebook and Instagram sample of 132, and population of this study is 200 users were selected for this study, sample size is calculated through ROA soft. Convenient sampling technique was selected for the respondents. Survey questionnaire was randomly conducted among Instagram, Facebook, and twitter by sending online questionnaire to collect the individual opinion from respondents.

6.2 Measurement and Scales

The survey questionnaire divided into two sections. Section one has demographic-related questions i.e. (age, gender) and section two has questions on 4 constructs and 16 indicators adopted from literature as seen in the appendix Table 1. These indicators were measured on the 5-point likert scale where 1 represents strongly agree and 5 represents strongly disagree. Moreover, the measurement scale summary is presented in Table 1.

In the following table it demonstrates the outcomes of pilot testing which show variables reliability, that are calculated through selected software SPSS. Subsequently, Chiou (2018) illustrates that the acceptable reliability value is 0.70 or greater than 0.70. Thus, this test was applied on the data collected from 15 respondents which was 5% of actual sample size of this research study.

7 Results

7.1 Descriptive Analysis

As seen the above table 2, the Skewness of all variables ranged between −0.446 and −1.614 that means the distribution is moderately to highly Skewed. The Kurtosis data

Table 2 Means, Std. Dev., Variance, Skewness and Kurtosis for the study factors

	Mean	Std. Dev	Variance	Skewness	Kurtosis
Sharing of fake news	3.95	0.605	0.366	−1.614	5.077
Cyberbullying	3.61	0.766	0.587	−1.116	1.716
Self-regulation	3.41	0.720	0.519	−0.446	0.249
Social media fatigue	3.64	0.723	0.522	−1.252	−0.775

Table 3 Mean, Std. deviation, composite reliability and AVE for the study factors

Constructs	Mean	Std. deviation	Composite reliability	(AVE)
Sharing of fake news	3.56	0.72	0.821	0.606
Cyberbullying	3.42	0.62	0.834	0.569
Self-regulation	3.67	0.88	0.902	0.650
Work technology conflict	3.88	0.89	0.798	0.774
Social media fatigue	3.88	0.89	0.798	0.774

range between 5.077 and −0.775 which means most variables shows the population very likely has positive excess kurtosis and only one variable shows the population very likely has negative excess kurtosis. The value with positive kurtosis value follows t-distribution whereas negative values follow the beta distribution (Barret & Morgan, 2015).

7.2 Convergent Validity

The results in Table 3 show that all composite reliability values are at least 0.70; and the values of AVE are at least 0.60 which confirm that the respective variables indicators have adequately convergent validity.

7.3 Discriminant Validity

The results in Table 4 show that the square of each pair of the correlation is lesser that the square of the explained variance. These results confirmed that all constructs are distinct and unique.

Table 4 The study factors correlations

	Sharing of fake news	Cyberbullying	Self-regulation	Social media fatigue
Sharing of fake news	0.754			
Cyberbullying	0.638	0.755		
Self-regulation	0.706	0.641	0.778	
Social media fatigue	0.561	0.623	0.867	0.812

Table 5 The study hypotheses testing

	Beta	T-stats	P-val	Results
Sharing of fake news − > Social Media Fatigue (H1)	−0.174	3.092	0.0021	Accepted
Cyberbullying − > Social Media Fatigue (H2)	0.144	2.448	0.0147	Accepted
Self-regulation − > Social Media Fatigue (H3)	0.863	20.322	0.000	Accepted

7.4 Path Coefficients

The results in Table 5 and Figs. 2 and 3 show that all four direct hypotheses were accepted, and three independent hypotheses are also accepted.

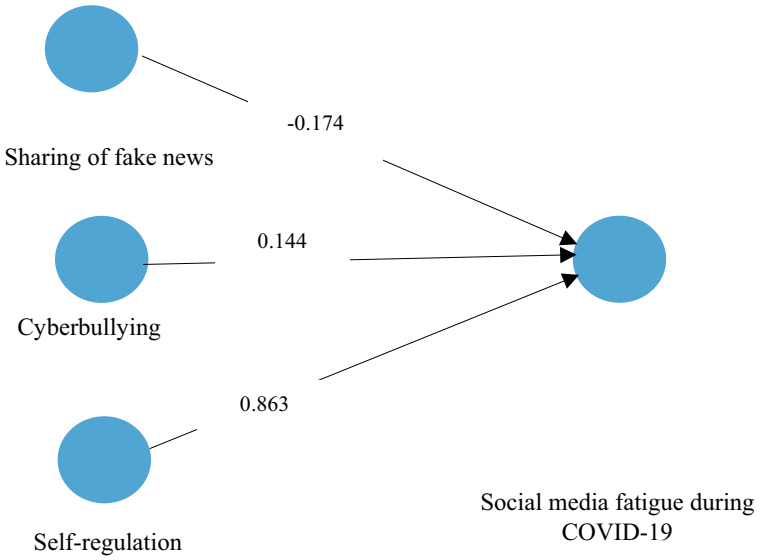

Fig. 2 Measurement model

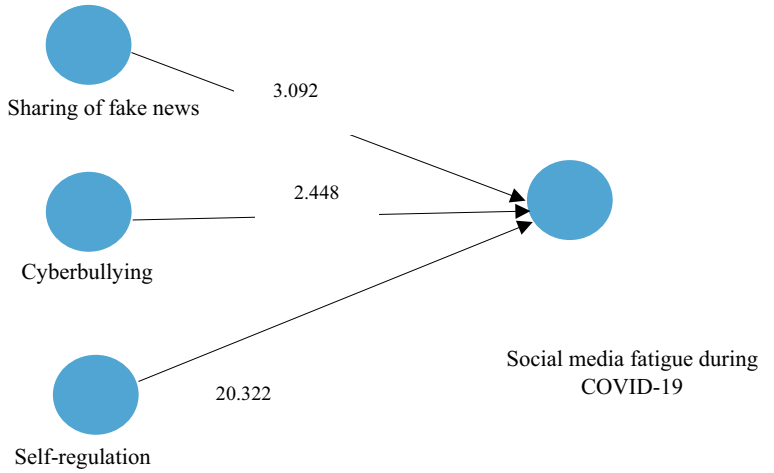

Fig. 3 Structural model

8 Conclusion

Technology is an integral part of our lives an important aspect which effects youth this research explored the dark side of social media during the first pandemic lockdown in the UK and adds to empirical evidence of the devastating effect of the COVID-19 pandemic on young people's mental health. The dissemination of unverified information has been showcased as a significant challenge during the COVID-19 pandemic. The role of social media in this process is exemplified by its increased use during COVID-19, as, for example, a recent report shows that the use of Facebook hit record levels during the pandemic. Further p-coefficients suggested that t-value of H1 3.092 the above table suggested that the following hypothesis is accepted and has significant effect of social media while H2 t-stats is 2.448 *p* value determine that this hypothesis is also accepted lastly H3 *p*-value is 0.000 and t-stats is 20.322. This study revealed that potential mechanisms for counteracting fake news creating Facebook pages of real news and using this advertising to disseminate accurate information this paper will enhanced the understanding the effects of SMA, cyberbullying and self-regulation on mental health of individual through the use of social cognitive perspectives.

9 Limitations

This paper has been methodological as well as theoretical limitations, first using CLT might be regarded limiting even through it has been adopted in past studies that are based on social media. The primary concern is the cognitive load theory is still essential an instructional science theory even through it has been adopted, use widely in HCI & also shown to explain not only learning but also acquiring knowledge from new theories, articles might be more useful for conceptualizing fake news sharing. Additionally, we chose factors with the help of previous studies and noticing gaps in prior literature. With regards to data collection, we collected cross-sectional responses from Pakistani social media users during the COVID-19 pandemic while the author also ensured the reliability and validity of our data, cultural and contextual specifically may be introduced in the outcome. Due to collecting data among adults our results may contain some bias. Furthermore, our sample consisted of younger adults and calculated through ROA soft, while in future other researchers may use different sample size technique such as rule of 5 and 10.

10 Recommendations

This research proposed sharing of fake news, cyberbullying and self-regulation on social media fatigue during COVID-19. Based on the findings of the study following are recommendations:

- Results demonstrates that there are several purposes of social media have an impact on sharing fake news, cyberbullying particularly people driven by entertainment, for example do not seem to be equally concerned about the information reliability they share on social media.
- We encourage future research into different purpose of social media (entertainment, sharing information and self-promotion) and their impact on the sharing misinformation.
- Future study needs to characterize the factors associated with the mechanisms through which emotional connection to social media and health-related outcomes are associated.

Appendix A

See Table A.1.

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Table A.1 Constructs and items in questionnaire

Sharing of fake News
Based on your experience which social media platforms offers a more fertile environment for the spread of a fake story
I share fake news because I don't have time to check facts through trusted sources
I share information or news on COVID-19 without checking facts through trusted sources
I share information or news on COVID-19 even if sometimes I feel the information may not be correct
Cyberbullying
Cyberbullying is normal in the world of social media
I would like to witness more kindness and respect on social media
Cyberbullying is a crime like any other crime
If someone is being cyberbullied, it is important to inform an adult
Self-regulation
My behavior is not that different from other people's
I have so many plans that it's hard for me to focus on any one of them
I don't seem to learn from my mistakes
I enjoy a routine, and like things to stay the same
Social Media fatigue
I find it difficult to relax after continually using social media
After a session of using social media, I feel really fatigued
After using social media, it takes effort to concentrate in my spare time
After using social media, it takes effort to concentrate in my spare time

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The Impact of Social Media Usage on Companies' Customer Relationship Management (CRM)

Abdallah AlShawabkeh, Mohammed T. Nuseir, and Sarah Urabi

Abstract This study examines the possibility of enhancing Customer Relationship Management through Social Media. As Social Media is a trending topic in companies' strategies, the aim of this research is to find a possible link between the use of Social Media, and its impact on Fashion retails' Customer Relationship Management in both UK and Germany. The use of Social Media platforms was explored by using a semi-structured survey. Significant differences were found in the usage of social media by age group and sex. The results revealed that using Social Media in marketing strategies for fashion retailors would be most effective when targeting younger demographics, offering companies the benefit of longer customer lifetime value when enhancing their Customer Relationship Management through Social Media.

Keywords Social media · Social media networking platforms · Social media marketing · Customer relationship management · CRM tools

1 Introduction

For the recent times, it is an undeniable fact that the evolution of social media has revolutionized the way customer relationship is managed (Malthouse et al., 2013; Almazrouei et al., 2020; Kurdi et al., 2021). Social media has changed the

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_8

way by which individuals communicate, interact, create content and share information including the effective and competent customer relationship management (Khasawneh et al., 2021a, b). The excessive and increasing usage of social media has affected every walk of life including the effective maintenance of the customer relationship management (Aljumah et al., 2021; Cretu & Brodie, 2007).

The use of technology and specifically the use of social media applications have made a significant change in the field of business (Al-Maroof et al., 2021; Alshurideh et al., 2019a). Firms and organizations of the current era have transformed and reallocated their budgets from traditional media of marketing and advertising to online platforms (Al Dmour et al., 2014; Brekke, 2009). Research has shown that the use of social media has much positive effect on the customer relationship management and the effective utilization of social media services can help organizations to achieve priority and preference of consumers over the offerings of their competitors (Alemán & Wartman, 2009; Palmer & Koenig-Lewis, 2009; Rodriguez, et al., 2015; Swarts, 2014).

In this regard, the most prominent social media applications include Facebook, YouTube and Twitter (Abuhashesh et al., 2021; Al Kurdi & Alshurideh, 2021). The customers can receive regular updates about the upcoming products of their preferred companies which explain how the use of these platforms play a leading role in helping the companies retain their current consumers as well as to attract new consumes across different walks of life (Soares et al., 2012; Alshurideh et al., 2019b, 2021). Moreover, the use of social media services helps in generating a positive word of mouth among the customers which additionally helps the organization to maintain a good reputation regarding their products and services (Abu Zayyad et al., 2021; Alshurideh, 2022; Buss and Begorgis, 2015).

Although many of the researched articles have indicated that there is a connection between Social Media and the positive outcomes of the implemented marketing strategies (Alshurideh et al., 2016; Katona et al., 2011), this research will investigate this apparent connection further. Moreover, the possibility of this connection positively influencing the companies' acquisition of new customers and the maintenance of the existing customers has also been examined (Alkitbi et al., 2020; Alsharari & Alshurideh, 2020; Alshamsi et al., 2020). Through finding a possible connection between these different factors, the research problem of 'why companies should be using Social Media to enhance their Customer Relationship Management' has been examined.

Therefore, the aim of this research is to detect if the use of social media can positively influence the companies' Customer Relationship Management (CRM). As there are still companies refusing to exploit new media technologies within their strategies, this research aims at looking at social media from a different perspective to highlight their importance on the marketing outcomes of the company. Therefore, the research question that this study aims to answer is; can companies enhance their CRM by using Social Media?

In order to reach the stated aim and to answer the mentioned research question, the objectives are as follows:

1. Analysing the medium of social media as a means of communication, by assessing literature, journals and articles dated no earlier than 2000, concentrating more intently on current literature.
2. Design and evaluate a questionnaire based on the framework laid out in this research. The questionnaire will be issued to people ranging from the age of 17 to 40+. The survey collected from this target group will offer a wide range of data to investigate the connection of social media to the marketing outcomes of the company as well as the possible relations of social media to specific demographics and therefore the possible effects that this may have on the companies' CRM.
3. Compare the findings from the current literature with the survey results and gain insight into the possible links between the two main factors, that is: social media and Customer Relationship Management (CRM).
4. Draw conclusions as to how CRM may be enhanced through the companies' usage of social media.

2 Literature Review

The concept of social media can be understood by assessing a statement by Sterne (1955, p. 51): "Social media is the connective tissue of social networks". The rise of social media as a new communication platform has enabled customers to become active participants within markets rather than passive recipients of marketing campaigns (Heckadon, 2010; Hennig-Thurau et al., 2010; Kleinberg, 2008). This has led to companies having to rethink their marketing campaigns, as the traditional marketing models have become more complicated due to the on-going changes within communication channels (Alshurideh et al., 2014; Füller et al., 2007).

Existing research by Heckadon (2010) has investigated critical success factors when implementing marketing strategies on social media platforms. In his Master Thesis, he defines ten critical success factors, namely "1. Having a social media marketing strategy, 2. Integrating the social media marketing strategy into the broader marketing strategy, 3. Social media optimization, 4. Creating a community, 5. Encouraging user content creation and feedback, 6. Being open and honest, 7. Keeping content fresh and relevant, 8. Making the user feel special, 9. Identifying with a cause, 10. Measuring social media marketing performance." (Heckadon, 2010, pp. 12–13).

Moving on, with regards to the communication strategies of companies, with the goals of increasing sales, recruiting new customers or even staff, strengthening the company's brand and image or improving Customer Relationship Management (CRM), communication between companies and customers has become one of the most important processes a company needs to concentrate on (Alshurideh et al., 2017; Alyammahi et al., 2020; Wallace et al., 2014).

Means of communication present a wide range of possibilities for a company (AlHamad et al., 2022; Alshurideh et al., 2022; Ammari et al., 2017; Ashal et al., 2021). Communication, be it from business to business (B2B) or from business to consumers (B2C), can take place in the form of public relations, fairs or exhibitions,

direct sales, classic advertisements, sales promotion, sponsoring, event-marketing or multimedia communication (Alzoubi et al., 2020; Felix, et al., 2017; Wang & Kim, 2017). As the more traditional communication channels are beginning to lose their effectiveness due to the rise of Social Media (Hennig-Thurau et al., 2010), it is important to understand why customers are so attracted to this new communication platform.

Having understood that social media can play an important part in interacting with customers and assessing new ideas (Hennig-Thurau et al., 2010; Maklan et al., 2008), the question at hand is, whether this can help companies enhancing their Customer Relationship Management? Hennig-Thurau et al. (2010) introduced the idea of a 'Pinball-Framework' to highlight the impact of these new social media platforms on customer relationships. They state, that companies using new media channels are merely playing Pinball. By throwing the 'marketing ball' into the web, companies supply customers with a message, however in what way this message is received or passed along is no longer in the company's hands, as even though they have 'flippers' to guide the message, the ball may not move in the anticipated direction, which could lead to catastrophic results. So does the possibility exist of enhancing Customer Relationship Management by using social media, or would it rather have the opposite effect?

When reviewing the literature, it seems that there is definite potential for social media to enhance companies' Customer Relationship Management (Heckadon, 2010; Hennig-Thurau et al., 2010; Katona et al., 2011). And so the following research hypothesis has been formulated:

H1 Social media has a positive impact on companies' Customer Relationship Management.

3 Method

To assess the developed research hypotheses, a quantitative approach were adopted that made use of a self-administered questionnaire. This questionnaire was distributed in 2016 to people from ages 17–40+ living in the United Kingdom or Germany. This target group was selected for this study to enable consideration of the possible influences of age, occupation status and culture on the survey results. The questionnaire had a very good response rate which is mainly because of the close contact to University lecturers and reliable contacts throughout the communities.

For this study, a total of 325 questionnaires were distributed. From these completed and returned questionnaires, 57 questionnaires were excluded from this study, because of the missing data in them. Therefore, the residual 268 responses denote an effective response rate of 82.46%, which is a fairly high rate, ensuring that the collected data is valid and the depicted results justified. The respondents were fairly equally divided in terms of gender, with 53.4% being female and 46.6% being male. In addition to this, 40.3% of all respondents were over 30 years of age, while 59.7%

were under 30 years old, which enabled the author to further distinguish social media usage in correlation to age.

3.1 Measures

The developed scales for this study were based on a 5—point rating scale (changed from four-point rating scale to five-point rating scale after the pilot-study), using the values (1) non-applicable, (2) strongly disagree, (3) disagree, (4) agree and (5) strongly agree. A pilot study was undertaken to test the understandability of the questionnaire and was handed out to ensure that nothing had been overlooked in the design of the questionnaire. After having conducted the pilot study, the following changes were made to the questionnaire, based on the feedback from the respondents:

- In Sect. 1 of the questionnaire, a 'Foundation Degree', 'Master Degree' and 'PhD' option were added to the existing options of first year, second year or third-year student in question 5
- In addition to the options of 'strongly agree', 'agree', 'disagree' and 'strongly disagree' within Sect. 2 of the questionnaire, a fifth option ('non-applicable') was added in order to allow respondents to state honestly if the stated question didn't apply to them
- The numbering on the questions was changed from discontinuous to continuous numbering in order to make the later analysis easier and give each question a definite identifier

Even though the changes made to the questionnaire were of minor nature, the analysis having more options in breaking down the respondents' demographics, and further decreasing the complexity that came from the discontinuous numbering, especially when cross-referencing the individual questions to the framework and indicators for all factors. In order to conduct the analysis, the IBM Statistical Package for Social Sciences (SPSS) version 20 was used.

4 Results and Discussion

In order to test the impact of social media on the Customer Relationship Management (CRM), the Pearson correlation was calculated (Table 1).

Table 1 Correlation of social media with CRM (Pearson coefficient)

Factor	Measurement	Social media	CRM
Social media	Pearson correlation	1	0.992
	Sig. (2-tailed)		0.000
	N	268	268

Table 2 Means of social media criteria

Factor	Criterion	Mean (in %)
Social media		54
	Information technology management	56
	Communication channel	52
	Collaboration (customer engagement)	54
	Building virtual communities/Networks	56

The results show a significant relationship between Social Media and Customer Relationship Management, which indicates that CRM can be enhanced through Social Media. Based on these insights it is important to determine which criterion of Social Media poses the most important, so that companies could specifically address these criteria in order to enhance their customer performance. Table 2 depicts the results from the conducted survey for each criterion of Social Media.

The survey results showed that the criterion 'Information Technology Management' as well as 'Building virtual communities' scored the highest at 2.8 (56%). Even though this poses only an average outcome, the results indicate that the strongest link between Social Media and CRM lies within the creation of virtual communities through Information Technology Management. This further indicates that companies' use of these criteria would promise the best results for enhancing their Customer Relationship Management.

4.1 How Important Is the Criterion Information Technology Management for CRM?

The frequency analysis for the questions linked to Information Technology Management is shown in Table 3. The most significant results are those on item 6, 9, 12, 13 and 16. Due to the choice of using a Fashion Retailers' case study, the questions were asked in accordance to fashion retailer interests. According to Hennig-Thurau et al. (2010), Kleinberg (2008) and Sterne (1955) Social Media offers companies the opportunity to perform market research at low costs, with the further ability to detect trends and attitudinal shifts within the market. However, when asking the survey respondents, if they discussed fashion trends with their friends on Social media platforms (item 6) 42.7% strongly disagreed. Yet 12.7% agreed to the statement and a further 1.9% strongly agreed. These numbers indicate, that fashion retailers would be able to discover trends based on sample groups of Social Media users. In addition to this it has been said in the literature that Social Media offers companies access to customer data (Heckadon, 2010; Katona et al., 2011). The results to item 9, 12

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Table 3 Frequency analysis for criterion information technology management

Item no.	Statement	Strongly agree (%)	Agree (%)	Disagree (%)	Strongly disagree (%)	Non-applicable (%)
6	I always discuss fashion trends with my friends on social networking sites	1.9	12.7	30.7	42.7	12
7	I always take part in questionnaires issued by companies even if they are not rewarded	1.1	18.4	36.8	35.7	7.9
8	I always accept friend requests made by companies on social networking sites	1.1	14.2	34.3	40.7	9.7
9	I am friends with more than one company on social networking sites (e.g. Primark)	6.7	21.6	25.7	34.3	11.6
10	I always 'like' companies social networking sites	3.4	22.4	32.5	31.7	10.1
11	I frequently comment on posts made by companies on social networking sites	1.5	5.6	33.8	48.9	10.2
12	On my social networking site profile, I always share personal information (e.g. date of birth, job etc.)	7.5	36.2	26.5	21.3	8.6

(continued)

Table 3 (continued)

Item no.	Statement	Strongly agree (%)	Agree (%)	Disagree (%)	Strongly disagree (%)	Non-applicable (%)
13	I don't mind at all letting companies see my personal profile	1.9	24.0	31.8	35.2	7.1
16	I strongly prefer sending direct messages through social networking sites to friends than posting something on my wall	28.8	39.3	12.7	10.1	9
Average		5.99	21.6	29.42	33.4	9.6
Mean (in %)		56				

and 13 verify this fact, as for each of these questions more than 20% of respondents agreed.

According to Wallace et al. (2014) Social Media users prefer more personalized advertising efforts by companies, which is emphasized by the fact, that the majority of respondents (68.1% in total) strongly preferred sending personal messages to their contacts on these networking platforms than openly displaying their interactions with others.

The comparison of respondent's answers with their age (see Fig. 1) showed a significant difference to the overall outcome for the criterion Information Technology Management. The respondents of under 30 years of age were far more willing to interact with companies as well as display their personal information on Social Media sites. Furthermore the respondents' answers to items 9 and 10 demonstrated that younger Social Media users are very interested in interacting with companies on Social Media sites, which emphasises companies' ability to engage customers as co-creators of value through using Information Technology (Füller et al., 2010).

The results of the survey furthermore depict that the possibilities for companies to use Social Media as a market research system (Kleinberg, 2008) are given, which means Information Technology Management should play an important role in Customer Relationship Management (Alshurideh et al., 2019a, b; Svoboda et al., 2021), as the amount of data available to companies can help improve customer services and company offerings (Aburayya et al., 2020; Al-Khayyal et al., 2021; Odeh et al., 2021).

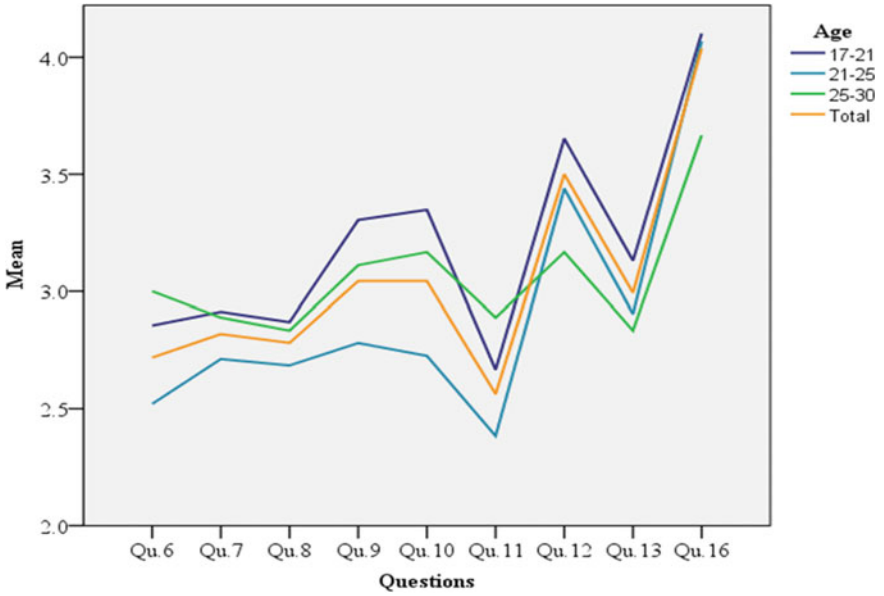

Fig. 1 Comparison of means between age and ITM

4.2 How Important Is the Criterion Communication Channel for CRM?

Companies using Social Media generally have the aim of communicating the companies' offerings and benefits to a broad audience, in order to reach a large crowd through the same mean. Within the survey, respondents were questioned on their behaviour when encountering advertising on social media platforms (Table 4).

This was done in order to determine the significance of Social Media as a communication channel. Interestingly enough, 43.3% of respondents strongly disagreed with reading advertisements on social media platforms. This confirms what Soares et al. (2012) have stated within their research. They say that Social Media users pose a new type of cyberspace consumer, who perceives advertisements on Social Media sites as intrusive and furthermore disruptive to their online activities. According to Sterne (1955) however, Social Media as a platform for communication is more important in terms of customers spreading the advertisements or messages of companies. In regard to this, respondents' answers to items 20 through 24 showed that on average 20%[1] had forwarded advertisements to friends or received advertisements from friends. This means that customers only find advertisements on Social Media sites interesting, when they appeal to their own individual needs in addition to delivering an important message.

[1] (2.2 + 18.7 + 2.6 + 15.4 + 3.4 + 13.8 + 2.2 + 21.7)/5 to evaluate the percentage of respondents that agreed with the statements.

Table 4 Frequency analysis for criterion communication channel

Item no.	Statement	Strongly agree (%)	Agree (%)	Disagree (%)	Strongly disagree (%)	Non-applicable (%)
17	When I receive advertisement on social networking sites I always read them	1.1	11.2	35.1	43.3	9.3
18	I am always interested in special offers by companies	10.2	27.8	30.8	25.9	5.3
19	I frequently follow posts on social networking sites by companies	0.8	14.7	38.0	37.2	9.4
20	When I like an advertisement on social networking sites I always respond (e.g. by 'liking' the comment)	2.2	18.7	29.2	40.8	9.0
22	When I receive a post or message I like I always forward it to my friends or post it on my wall	2.6	15.4	40.4	32.6	9.0
23	When I find an interesting advertisement I always post it on my wall or forward it to my friends on social networking sites	3.4	13.8	29.9	42.5	10.4
24	I always receive posts by my friends when they find interesting advertisements	2.2	21.7	32.6	33.0	10.5

(continued)

Table 4 (continued)

Item no.	Statement	Strongly agree (%)	Agree (%)	Disagree (%)	Strongly disagree (%)	Non-applicable (%)
46	Advertisement on social networking sites always makes me purchase merchandise	1.1	4.5	36.6	47.8	10.1
Average		2.95	15.98	34.08	37.89	9.13
Mean (in %)		52				

Therefore the average outcome of 52% for Social Media as a communication channel indicates that this criterion is less important than the other criteria for Social Media usage in companies' marketing strategies in order to enhance Customer Relationship Management.

4.3 How Important Is the Criterion Collaboration for CRM?

The results for the criterion 'collaboration' showed only an average outcome with an overall mean of 2.7 (see Table 5). This means that the respondents viewed this criterion as less important than 'Information Technology Management' and 'Building virtual communities/networks', answering the research question 'What role does collaboration on Social Media play within CRM?'. When looking at the results, there were significant opinions expressed. The majority of respondents (41.2%) agreed to always commenting back on comments made by their friends on social media platforms, which correlates to Herrmann, et al. (2000) research, where it was stated that companies would be able to use customers' need to share to their advantage.

However, when asking the respondents whether they had used social media platforms to praise or complain to companies 50.6% strongly disagreed to writing complaints and 49.6% strongly disagreed to writing praise. This diminishes companies' ability to improve their services by using customers as co-creators of value, which was stated as critical factor in the literature (Hennig-Thurau et al, 2010; Maklan et al., 2008). In order to distinguish whether this was true for all users of Social Media, a mean comparison was undertaken, to correlate the importance of collaboration with age (see Table 6).

The results show that younger users found collaboration on social media platforms more important (62%) than older users (46%). Even though this outcome is still fairly low, it indicates that companies using Social Media would be able to engage more effectively with younger customers than older customers on these platforms,

Table 5 Frequency analysis for criterion collaboration

Item no.	Statement	Strongly agree (%)	Agree (%)	Disagree (%)	Strongly disagree (%)	Non-applicable (%)
15	I always share everything that happens to me with my friends on social networking sites	3	11.2	38.2	39.7	7.9
25	When a friend posts something on my wall I always comment back	13.9	41.2	23.6	11.6	9.7
26	When I have ideas on how to improve products or services I always contact companies through their social networking sites	1.1	7.1	35.1	46.3	10.4
27	I have written many complaints to companies through social networking sites	1.5	3.7	32.6	50.6	11.6
28	I have written many praise to companies through social networking sites	0.4	6.8	30.8	49.6	12.4
29	I am definitely active in more than one group on social networking sites	11.7	29.7	24.4	25.2	9.0
Average		5.27	16.62	30.78	37.17	10.17
Mean (in %)		54				

Table 6 Mean comparison between age and criterion collaboration

Criterion	Age					
	17–21	21–25	25–30	30–40	>40	Total
Collaboration (Customer engagement) (%)	62	54	60	56	46	54

by integrating them into their strategies and encouraging them to interact with the company.

4.4 How Important Is the Criterion Virtual Communities/networks for CRM?

Based on Heckadon's (2010) research, companies using Social Media should have the main aim of creating online communities in order to benefit from customers' social capital (Alemán & Wartman, 2009; Herrmann, et al., 2000). Therefore respondents were asked questions on their behaviours towards their online Social Media to come to conclusions of companies' ability to benefit from these.

The majority of respondents (35.6%) agreed to have friends from all over the world on their Social Media platforms. This indicates that companies could address large customer bases in order to acquire new customers even on an international basis. Surprisingly only 28% of respondents agreed to appreciating companies responding to inquiries, which indicates that the majority of Social Media users prefers to keep their platforms in a private environment. The high number of respondents disagreeing with question 33 (40.7%) shows that peer pressure, in this case to always have the same interests as friends, was not essential for the respondents' behaviour on these platforms, depicting the differences in social structures on Social Media sites (Ansari et al., 2011; Kleinberg, 2008). Based on this, companies would be able to access data on customers with more diverse interests, increasing the companies' ability to assess a broader range of perceptions (Table 7).

As the only average outcome (56%) was unexpected, the results were analysed separately for the different age groups (see Table 8). The analysis clearly shows that younger respondents' answers were very high. This means that companies targeting this demographic would have access to large and diverse communities when using Social Media.

4.5 Testing of Hypotheses

After having analysed each criterion for the different factors thoroughly, it can be said that there is a definite influence of age on companies' ability to utilize Social Media in order to enhance their Customer Relationship Management. Furthermore, the extraordinary significance of the different factors on each other indicates a positive confirmation of the proposed hypothesis (see Table 9).

The correlation between all factors is more than significant (as the correlation becomes significant at the 0.01 level (2-tailed)). Each factor being significantly higher than 0.01 it is indicated that Customer Relationship Management could assuredly be

Table 7 Frequency analysis for criterion virtual communities

Item no.	Statement	Strongly agree (%)	Agree (%)	Disagree (%)	Strongly disagree (%)	Non-applicable (%)
21	I currently have friends from all over the world on social networking sites	21.0	35.6	20.6	14.6	8.2
30	I have always used social networking sites to find new friends	4.9	15.7	32.8	36.9	9.7
31	I feel very sad when my friends on social networking sites do not comment on my posts	3.4	10.1	36.3	38.6	11.6
33	I always join groups on social networking sites if my friends are in it	1.1	11.9	40.7	37.3	9.0
47	I feel very happy, when companies respond to my enquiries	7.8	28.0	15.7	26.1	22.4
Average		7.64	20.26	29.22	30.7	12.18
Mean (in %)		56				

Table 8 Survey results by age for the criterion virtual communities

Independent variable	Criterion	Corresponding questionnaire questions				
Age	Virtual communities (%)	Item 21 (%)	Item 30 (%)	Item 31 (%)	Item 33 (%)	Item 47 (%)
17–21	64.28	77.2	60.6	58	60.6	65.2
21–25	55.68	68	55.6	50.4	52	52.4
25–30	64.88	78.8	64.4	54.4	62.2	64.4
Total	60.42	73.2	58.8	54.2	56.8	59.2

Table 9 Correlation of different framework factors (Pearson correlation coefficient)

Factor	Measurement	SM	CRM	Acquisition	Maintenance
Social Media	Pearson correlation	1	0.992	0.965	0.968
	Sig. (2-tailed)		0.000	0.000	0.000
	N	268	268	268	268

Table 10 One-way Anova for hypothesis

Factor	Measurement	Sum of squares	df	Mean square	F	Sig
Social media	Between groups	121.830	102	1.194	166.912	0.000
	Within groups	1.181	165	0.007		

enhanced through Social Media. However to fully confirm this, a one-way analysis of variance (one-way ANOVA) has been conducted (see Table 10).

In order to test the hypotheses for this research a further one-way Anova test was run to depict the level of significance of Social Media on CRM (see Table 10).

The results clearly show that there is a strong significance Social Media to Customer Relationship Management. This is due to the significance for Social Media is less than 0.001, which is the set-out level in the analysis of variance. This means that the hypothesis of this research is supported:

H1 Social media has a positive impact on companies' Customer Relationship Management.

5 Discussion

This research analysed, whether the use of Social Media has a positive impact on companies' ability to enhance their Customer Relationship Management. Overall the analysis showed that there is a significant relationship between the two factors and that all four criterion factors of Social Media (information technology management, communication channel, collaboration (customer engagement), and building virtual communities/networks) are also important in this regards. These findings enabled the verification of the proposed hypotheses.

The analysis of the positive impact that Social Media has on Customer Relationship Management was verified through strong correlations between the two factors. Also, the main criteria for Social Media to be effective in companies' strategies were depicted in this research as Information Technology Management, Communication Channel, collaboration and building virtual communities. The analysis showed that the criteria Information Technology Management as well as building virtual communities and collaboration were perceived as most significant to respondents. The results of the research further revealed that the younger generations were the definite target

audience when using Social Media in communication strategies, which was in attunement with what was stated in the literature (e.g., Heckadon, 2010; Hennig-Thurau et al., 2010; Katona et al., 2011; Rodriguez et al., 2015; Wallace et al., 2014).

On the whole, these findings therefore highlight that using Social Media in company strategies can effectively enhance company performance, even during difficult times as the recession. In order to investigate possibilities on how best to do so, Sect. 3 of the questionnaire examined the respondents' knowledge on companies already using Social Media and to further gain insights into their interests in companies exploiting it. The literature had offered several activities of companies on Social Media and so the respondents were asked to choose the activities they would like companies to pursue most (see Fig. 2). Respondents were asked this question simply to derive an entry gate into the medium of Social Media in order to enhance Customer Relationship Management effectively.

The results clearly showed that Social Media users were most interested in discounts, special offers and new products, which relates to what has been stated within the literature in terms of increasing customers' awareness towards company offerings using Social Media (Heckadon, 2010; Sterne, 1955). The answers furthermore revealed that the respondents were very interested in receiving information on companies, which they later elaborated on by requesting information on companies charity work, Corporate Social responsibility and policies. If companies were to make this information available to customers on Social Media platforms, they would be able to improve their reputation and therefore enhance the acquisition of new customers and the maintenance of existing customers. The greatest possibility to enhance Customer Relationship Management through Social Media however, was

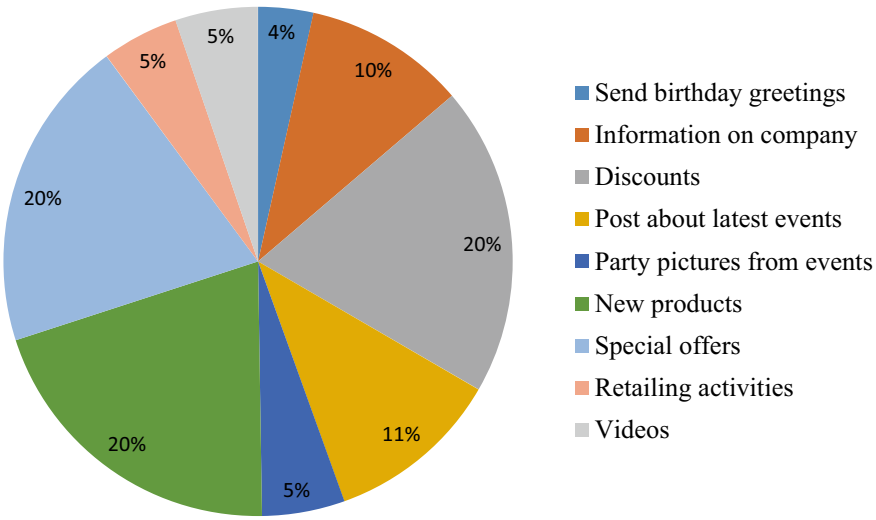

Fig. 2 Activities that social media users are most likely to pursue

Licensed to (putm@utm.my)

through being honest with customers. Survey respondents requested that companies openly display any critique or complaints they encountered by other customers, so that they could make informed decisions. This reflected what Heckadon (2010) had listed as a Critical Success Factor for implementing Social Media Marketing campaigns.

Interestingly enough, 31.12% of respondents were already following companies' Facebook pages which suggest that the relevant companies therefore have access to all of their followers' Social Media platforms, which increases the effective number of people they can address by far. Furthermore 64% of all respondents were able to name companies that were already active on Facebook, which confirms what Sterne (1955) and Heckadon (2010) have stated on increasing customer awareness using Social Media. Even if all the respondents were not following these companies on Facebook, their knowledge of the companies' sites displays the fact that they were reached. This is most likely due to their friends on Facebook following these companies and therefore coming to their attention.

Companies' using Social Media platforms also benefit from the phenomenon of word-of-mouth, which has come to be known online as a part of viral marketing, which is also known as word-of-mouth marketing (Felix, et al., 2017; Wang & Kim, 2017). Social Media enables customers to act pro-actively when engaging with companies (Hennig-Thurau et al., 2010), which gives companies the opportunity to integrate customers in their strategies and use their contributions to create greater value in their offerings. By incorporating Social Media into companies' marketing campaigns, companies are therefore able to incorporate customer insight into their strategies by engaging customers in conversations rather than simply addressing campaigns at them (Hennig-Thurau et al., 2010; Maklan et al., 2008).

However, the fact that Social Media as a communication channel (advertising) was not well received by respondents lies within the fact that most Social Media users feel that advertisements on Social Media site are disruptive to their personal aims when using this medium (Soares et al., 2012). This means that advertisement efforts on Social Media platform need to be constructive and informative rather than overpowering.

6 Conclusions

Social Media has become one of the most talked-about platforms in today's' interconnected world. It offers different opportunities for people to engage with each other and share their thoughts and feelings as well as photos, videos and music. Even though research has shown the profitability of using social media in marketing strategies, some companies are still hesitant to enter this new communication platform. With respect to this fact, the aim of this research was to determine whether social media has a positive influence on companies' Customer Relationship Management (CRM). By doing so, it was hoped to eliminate any remaining doubts of Social Media's potential in companies marketing strategies especially during a time when recession

is persistent in the economic climate. By linking their marketing strategies to social media and accordingly to Customer Relationship Management, this research aimed at providing evidence, that social media can effectively enhance Customer Relationship Management and that companies should therefore not dismiss this new medium as part of their strategy.

6.1 Practical Implications

The main aims within Customer Relationship Management are to acquire new and maintain existing customers. Due to the boom in Internet technologies, companies' need to enter into this platform becomes evident. Social Media as a current hot topic in company strategies poses an effective way for companies' to connect with their customers with low investment costs and several opportunities to interact effectively. In such a competitive environment as we live in today, companies seek every opportunity to differentiate themselves from their competitors. The recession that has been presiding worldwide has further led to customers switching brands, which has made Customer Relationship Management an essential tool for companies in order to maintain customers and avoid loss of customer loyalty.

By using Information Technology Management as part of Social Media, companies will be able to develop customer-oriented products and services based on their close interactions with customers and the insight into customer data. The market research that is enabled through Social Media will enable companies to benefit further from lower costs in developing new products and services. In addition to this, it is necessary for companies to continually update their Social Media sites in order to show customers that they care about them and further anticipate customers' to respond even when companies post about challenges they may be facing. This will enable companies to increase their customer loyalty resulting in longer lifetime value and effectively enhance their Customer Relationship Management. Therefore companies need to effectively make use of the fact that Social Media enhances customer relationships and can be used to improve their customer experience.

6.2 Limitations and Suggestions for Future Research

Like most research studies, this study also had some limitations. Because of the limitations of time, data that was collected in 2016 was used for this study. There is a likely chance that the opinions of the people have changed from back then particularly about the marketing approaches of companies on social media platforms since frequent changes are made on these mediums and new features are rapidly added over time. Also, the different techniques of marketing on social media platforms also need to be assessed to gain an insight into the particular kind of techniques that can have the most positive influence on companies' CRM.

Appendix

Appendix 1 Research Questionnaire

Section 1 - Personal Profile

Please tick the appropriate box

1. **What is your sex?**
   o Female o Male
2. **How old are you?**
   o <17 o 17-21 o 21-25 o 25-30 o30-40 o >40
3. **What country do you live in?**
   _____
4. **What is your current occupation (job description/job title)?**
   _____
5. **If you are a student, what year are you in at University?**
   o 1st o 2nd o 3rd o Foundation Degree o Master Degree o PhD

Section 2 - Project-Questions

Below you will find different statements to the different areas that are discussed within my dissertation. Please tick the box, which most expresses your opinion. Note that there are no multiple answers possible unless stated otherwise.

Q (No)	Statement	Strongly agree	Agree	Disagree	Strongly disagree	Non Applicable
6	I always discuss fashion trends with my friends on social networking sites					
7	I always take part in questionnaires issued by companies even if they are not rewarded					
8	I always accept friend requests made by companies on social networking sites					
9	I am friends with more than one company on social networking sites (e.g. Primark)					
10	I always 'like' companies social networking sites					
11	I frequently comment on posts made by companies on social networking sites					

Q (No)	Statement	Strongly agree	Agree	Disagree	Strongly disagree	Non Applicable
12	On my social networking site profile, I always share personal information (e.g. date of birth, job etc.)					
13	I don't mind at all letting companies see my personal profile					
14	I comment frequently on friends posts on social networking sites					
15	I always share everything that happens to me with my friends on social networking sites					
16	I strongly prefer sending direct messages through social networking sites to friends than posting something on my wall					
17	When I receive advertisement on social networking sites I always read them					
18	I am always interested in special offers by companies					
19	I frequently follow posts on social networking sites by companies					
20	When I like an advertisement on social networking sites I always respond (e.g. by 'liking' the comment)					
21	I currently have friends from all over the world on social networking sites					
22	When I receive a post or message I like I always forward it to my friends or post it on my wall					
23	When I find an interesting advertisement I always post it on my wall or forward it to my friends on social networking sites					
24	I always receive posts by my friends when they find interesting advertisements					
25	When a friend posts something on my wall I always comment back					
26	When I have ideas on how to improve products or services I always contact companies through their social networking sites					
27	I have written many complaints to companies through social networking sites					
28	I have written many praise to companies through social networking sites					
29	I am definitely active in more than one group on social networking sites					
30	I have always used social networking sites to find new friends					

Q (No)	Statement	Strongly agree	Agree	Disagree	Strongly disagree	Non Applicable
31	I feel very sad when my friends on social networking sites do not comment on my posts					
32	All of my friends on social networking sites currently have the same friends on social networking sites as me					
33	I always join groups on social networking sites if my friends are in it					
34	I always trust the judgment of my friends on social networking sites concerning purchasing experiences					
35	There are some friends on social networking sites whom I rely on more than others					
36	I frequently communicate with friends via social networking sites					
37	I always accept friend requests from people I don't know					
38	If I receive a friend request from someone who knows one of my friends I always accept					
39	Without my friends on social networking sites I would not know what to do all day					
40	I currently have many friends on social networking sites whom I don't know personally					
41	*All* of my friends on social networking sites are also friends offline					
42	I am always interested in reading about others' status on social networking sites					
43	I am strongly influenced by others experiences posted on social networking sites					
44	My friends frequently purchase merchandise from fashion retailers such as Primark, Peacocks or New Look					
45	I frequently purchase merchandise from certain fashion retailers due to my friends on social networking sites recommending them					
46	Advertisement on social networking sites always makes me purchase merchandise					
47	I feel very happy, when companies respond to my enquiries					

Appendix 2 Criteria and indicators for social media

Criteria/Value	Information technology management	Communication channel	Collaboration (customer engagement)	Building virtual communities/Networks
Customers	(ITM1) Discover trends and shifts in the market; SM as market research system (Sterne, 1955)	(A1) Send message from company to customer; build awareness towards company (Heckadon, 2010; Sterne, 1955)	(C1) Use customers' need to share to company's advantage (e.g., use critique to improve service) (Ang, 2011)	
	(ITM2) Involve customers in the business; Research on customers is conducted in their own interest rather than just being 'researched' (Ang, 2011; Maklan et al., 2008)	(A2) Reaching a large number of customers (Sterne, 1955)	(C2) Interacting with customers to assess new ideas (Füller et al., 2010; Hennig-Thurau et al, 2010; Maklan et al., 2008)	
	(ITM3) Integrate the personal information gained from SM into strategies; SNS as sources for member data, friendship data, communication data etc.; collection & comparison to enhance the customer experience (Ang, 2011; Ansari et al., 2011; Payne & Frow, 2006)		(C3) Interactive collaboration; customer as co-creator of value (Füller et al., 2010; Hennig-Thurau et al, 2010; Maklan et al., 2008)	

(continued)

(continued)

Criteria/Value	Information technology management	Communication channel	Collaboration (customer engagement)	Building virtual communities/Networks
Company	(ITMC1) Path of communication: direct messaging or comment (Ansari et al., 2011; Zsolt et al., 2011)	(AC1) Customer reaction (e.g., passed message along) (Sterne, 1955)	(C4) Online relationships are formed to forge collaborative relationships (Ansari et al., 2011:725)	(CBC1) SM helps to build social network; Increase social capital (Ang, 2011; Martínez Alemán & Lynk Wartman, 2009)

Appendix 3 Criteria and indicators for customer relationship management

Criteria/Value	Social structures	Relationships
Success factors depicted from the company's perspective	(ACQ1) Increase revenue (Sterne, 1955)	(MAI1) Improve customer satisfaction (Sterne, 1955)
		(MAI2) Involve customers in the business (Sterne, 1955)
	(ACQ3) Getting potential customers' attention (Sterne, 1955)	(MAI3) Identify customer needs (Payne & Frow, 2006)
		(MAI4) Reduce costs of gaining new customers by satisfying existing customers (Sterne, 1955)
	(ACQ5) Convince them of the company's benefits (leading them into purchase) (Sterne, 1955)	(MAI5) Response to queries (Sterne, 1955)
	(ACQ6) Interaction with potential customers (Sterne, 1955)	

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Regulating Social Media and Its Effects on Digital Marketing: The Case of UAE

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Abstract Digital Marketing is the most efficient way to market a product/service in the modern era. The most crucial constituent of digital marketing is social media, and it is used by half of the world. People use it to share content in text, images, videos, and live streams. Major social media platforms are Facebook, Youtube, Instagram, Twitter, and LinkedIn. In recent times, social media platforms put regulations on using their platforms regarding sharing content related to violence-inciting, spreading nudity, sexual harassment, etc. This research has discussed these social media regulations and their effects on digital marketing by performing a questionnaire-based survey by leading digital marketing firms. Results are showing that social media regulations have positive effects on digital marketing.

Keywords Digital marketing · Social media regulation · Violence inciting · Social media marketing

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_9

1 Introduction

Social Media is an interactive modern-day digital technology that allows the users to create and/or share content like information, videos, pictures, etc. with the public by using different virtual networks and communities such as Twitter, Youtube, Facebook, Instagram, Tiktok, etc. (Khasawneh et al., 2021a, b; Kietzmann et al., 2011; Obar & Wildman, 2015). Twitter is a social media platform where people create and share content in the form of short messages. Youtube is a platform where people share their content in the form of videos. Tiktok and Instagram are used to share short videos, while Facebook is used for all types of content to share with the public, including videos, photos, and text (Storm, 2020). According to a Global Digital Overview report, many people use social media worldwide; there are 4.5 billion people who use the internet, and 3.8 million use social media. It means around 60% population of the planet uses social media (Dwivedi et al., 2021; Kemp, 2020). Several features attract social media, remaining in touch with family members, friends and reading their favorite celebrities and politicians (Aljumah et al., 2021a, b; Kurdi et al., 2021; Smith, 2011).

As more than half of the world uses social media, it attracts business. In the modern era, especially during the pandemic, businesses are going on the online mode (Akour et al., 2021; Al-Dmour et al., 2021; Alshurideh et al., 2021a, b; Leo et al., 2021). People were bringing online sales/purchase features to their businesses because it was the only way to survive (Al-Khayyal et al., 2021; Obeidat et al., 2019; Sweiss et al., 2021). According to UNCTAD, there was an increase of 10% regarding online shopping during pandemic (UNCTAD, 2020). As the business world is moving online, the marketing industry also went online (Mashaqi et al., 2020; Sultan et al., 2021). Social media platforms use social media platforms to market a product is termed social media marketing (Al-Maroof et al., 2021; Nuseir et al., 2021; Nuseir & Aljumah, 2021; Tuten, 2020). Social media marketing is performed by sharing content, videos, and/or photos with the public; all the marketing is performed using digital technology known as Digital Marketing (Aljumah et al., 2021c; Almazrouei et al., 2020; Alshurideh et al., 2022; Lee et al., 2022a, b; Tariq et al., 2022). Digital marketing is a broad term related to marketing on the internet, either on social media or outside social media like google, games-ads, etc. (Almaazmi et al., 2020; Chaffey & Ellis-Chadwick, 2019; Aissani & ElRefae, 2021). Digital marketing is a great way to market a product, 4.5 billion people using the internet is the market where you can promote your product. Most of the public uses social media; the main constituent of digital marketing is social media marketing, and it is such a powerful technique to promote a business by reaching the customers via social media (Ahmed et al., 2020, 2021; Alshurideh, 2022; Anjum et al., 2012). The marketing objects of different companies' products and services have been obtained by digital marketing at relatively low rates to conventional marketing (Ajina, 2019). This can provide great success to one's business by raising brand awareness, increasing traffic on the website, developing the brand's identity, the positive association of brand, increasing the leads, and improving communication with customers by direct contact on social

media. Conclusively, digital media is mandatory to develop a business in this modern era (Abu Zayyad et al., 2021; Alshurideh et al., 2015, 2019a, b; Hamadneh et al., 2021; Morris, 2009).

The topmost famous and worthy social media platforms are Facebook, Twitter, Instagram, Youtube, and Linkedin. According to stats, more than two billion users, men, and women, between having ages of 18–65 years on Facebook; here, the users can share images, videos, text notes, live streams, develop a community, and initiate a business page. Twitter has the reach of 330 million users of age range 18–49, and users can write a concise, engaging, and informative short message having 280 characters. Instagram has reached more than one billion people ages 18–64; here, users mostly come with photos, short videos, and live streams. It is the best platform for marketing the young urban area public. Youtube has two billion-plus users within the age of 18–65 years, and here users can share videos of all kinds. At last, there is LinkedIn, a platform with 303 million users of ages 25–64 years. It makes the user able to share professional content (WebFX, 2021).

One of the main reasons for social media's success as compared to mainstream media was uncensored content (Abuhasheshv et al., 2021; Al Kurdi & Alshurideh, 2021). People use it with the freedom to share, discuss everything they want, which is not possible on the mainstream media. On the other hand, it is noted that social media is used for cyber-bullying, gang-related crimes, and harassment. Besides, it is noted that social media has been a reason for self-harm, mainly cyber-suicide (Cash et al., 2013; Hinduja & Patchin, 2010; Ruder et al., 2011). The bullying performed using the computer and internet-related communication platforms are termed cyberbullying (Menesini et al., 2012; Smith et al., 2008).

Furthermore, humans were facing purposeful misinformation and dehumanization of a particular group and false allegations; but in the era of social media, the process of purposeful misinformation has been accelerated. Violent racists have gained access to a public platform to incite hate and violence even across the borders. On social media, the extremist views and conflict narratives are spread very quickly and grab public attention (Miro-Llinares & Rodriguez-Sala, 2016; Mutahi & Kimari, 2017).

Technologies related to digital and social media are widely implemented to awareness creating of political promotions (Grover et al., 2019; Hossain et al., 2020; Kapoor & Dwivedi, 2015; Shareef et al., 2018). Politicians use social media to campaign against the opposite party; social media was used for political misperception. It was used to blame the opposite parties, spread fake news, and reduce a person or party (Elsaadani, 2020; Garrett, 2019). We have an example of Myanmar, where outright incitement and dehumanizing language were amplified to mass murder through Twitter and Facebook, mainly targeting the Rohingya Muslim minority (Lee, 2019). Facebook released a report related to the Rohingya Muslim killing and accept that "Facebook has become a means of those seeking to spread hate and cause hate." There is another political violence incitement example via social media; in Syria, people popularized a hashtag on Twitter, #SyriaHoax, where they discredit the chemical attack evidence on civilians like Douma and Khan Dheikhoun (MRGI, 2019). On the other hand, the killing of 40 Indian soldiers in Kashmir was stoked by social media between Pakistan and India (Gettleman & Yasir, 2019).

After an intensive misuse of social media for Violence incitement, Sexual Harassment, Mass Killing, Misperception, etc., the social media platforms decided to bring "Social Media" regulations against those who misuse these platforms. In this connection, all the social media platforms developed their regulations and refined the content based on these regulations. As we talk about Facebook, they developed regulations against violence incitement, either political or public; they do not allow any individual or organization on their platform to perform or originate terroristic activities, violence, mass murder, etc. On Facebook, the sale of non-medical drugs and ammunition is a ban. Further, they do not allow any content under the boundaries of suicide, sexual exploitation of children and adults, nudity, harassment, bullying, and privacy violation (Facebook, 2022).

On the other hand, Twitter also developed a list of regulations; no one can threaten any other individual or group of people, no one can incite violence. They cannot be the promotion of terrorist activities. Harassment and child sexual exploitation has no room on Twitter. Self-harm, suicide, and hate based on race and religion can't be promoted. Illegal goods, including drugs and ammunition, cannot be discussed, purchased, and sell on Twitter (Twitter, n.d.). Similarly, Youtube, Instagram, and LinkedIn have regulations to share and spread the platforms' content (Instagram, 2013; LinkedIn, 2020; YouTube, n.d.).

Recently, a political complication has noticed during the presidential election in the United States. Where the thousands of Ex-President Trump's followers breached and stormed Capitol Hill. These followers were incited for violence by Ex-President Trump through his social media accounts, resulting in four civilians and one police officer. Facebook and Twitter get into action and perform a detailed analysis of Trump's social media posts and tweets and found Ex-President Trump guilty for violating the regulations of "Violence Incitement" Facebook and Twitter blocked his social media accounts. Facebook blocked permanently, and Twitter blocked his account temporarily with the warning. In reply, Ex-President Trump smashed Twitter with the allegations of keeping him away from the right of Freedom of Speech (BBC, 2021), as shown in Fig. 1.

This has become a red-hot debatable topic; either the regulations of Facebook and Twitter are against the freedom of speech, and their act of terminating Ex-President trump's social media accounts is an act of keeping Trump from his right of freedom of speech. Different journalists and researchers address different perceptions. Some are saying the banning of Trump's accounts is not against the freedom of speech. Trump violated private social media platforms' regulations, and they have taken actions against him as per their regulations (Romano, 2021). Some say the termination of Trump's account is double standards of social media platforms (Mehmood, 2021). However, German Chancellor 'AngelMerkel' said that Donal Trump's Twitter account's termination is problematic. In addition to this, Navalny, a Kremlin critic, said Trump's ban is against freedom of speech; this precedent will be exploited by the enemies of freedom of speech around the world, in Russia as well. Every time when they need to silence someone, they will say: this is just standard practice; even Trump got blocked on Twitter (Campbell, 2021). So, there are diversified perceptions regarding the ban of Trump's social media account and social media regulations. In

Fig. 1 Trump's response on the termination of his social media accounts

this paper, this question has been asked by the social media experts and tried to find out the 'point of view' of social media experts regarding the termination of Trump's account and freedom of speech.

2 Problem Statement

As the effective implementation of regulations by social media platforms, including Trump's account suspension, leaves a perception of an attack on users' freedom of speech. It might be possible that the users quit using leading social media platforms where the business advertisement through digital marketing occurs. It is possible the social media regulations put an adverse effect on the reach of leading social media platforms which ultimately affects the reach of digital marketing.

3 Purpose of Research

After Trump's ban by social media platforms, it is noticed that the social media platforms are strictly following their regulations even after intense opposition. This makes people cautious regarding digital marketing. To find out the effects of social media regulations on digital marketing, this study has been made. Because digital marketing is the best marketing way in the modern era, businesses' development is based on digital marketing. In this regard, this research paper is developed by performing actual market-based research where the social media regulations and their effects on digital marketing are discussed with the digital marketing experts, including Trump's social media accounts suspension.

4 Data Collection and Methodology

A structured questionnaire has been developed to collect the data for this research. The questionnaire consists of two sections having twenty questions; in the first sections, the respondent asked about their names, organization details, and their designation in the organization. This section will give us the information about the respondent and the disclose worth of its response. If a respondent is not having expertise regarding digital marketing and social media, it will be excluded during the data analysis, as shown in the flow chart of Fig. 2. In the second section of the questionnaire, the respondent asked to give their response regarding the effectiveness of digital marketing and its types, best platforms of digital marketing, awareness and effectiveness of social media regulations, social media regulations relation to freedom of speech, termination of Trump's account and social media regulations, and the relation of social media regulations with digital marketing.

This structured questionnaire has been developed on Google® Forms to be easily shared with the participants and record the responses efficiently. These research participants are the digital marketing experts from twelve leading digital marketing firms working in the United Arab Emirates. The questionnaire was shared with these organizations and get the fifteen responses from the participants within ten days. After this duration, the responses stopped to receive and start analyzing the data. The initial data analysis has been performed in Microsoft® Excel, and for the final data analyzing the collected data from respondents has been added in IBM® SPSS.

Data analysis has been performed and finds out fractions of the responses as per their nature. Moreover, the data of essential responses have been visualizing, including the best social media platform among respondents, one of the most beneficial regulations, and Trump's account termination responses. After the data visualization, the results have been explained and discussed.

5 Findings

The survey questionnaire has been responded to by Digital Marketing Experts, and their responses are analyzed using SPSS software. All participants confirm that digital marketing is better than conventional marketing, and 66.7% of the participants believe that digital marketing is highly effective while remaining marked digital marketing as effective only. On the other hand, all of the participants said that the best type of digital marketing is social media marketing; furthermore, 60% of the participants believe that Facebook is the best platform for marketing, 20% marked for Instagram, 13% said youtube is best for marketing and remaining said Twitter is better for marketing, as shown in Fig. 3.

Most of the participants believe that the social media regulations are effective for the social media users; 42% of them marked that social media regulations are highly effective for the users, while 35.7% believe it is just effective for the users. More

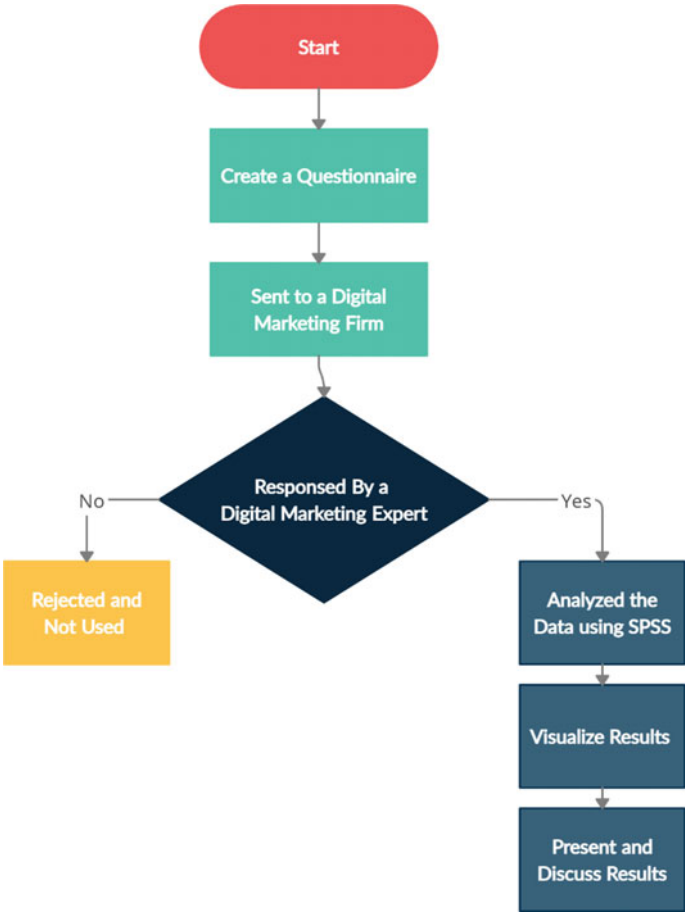

Fig. 2 Reserach flow chart

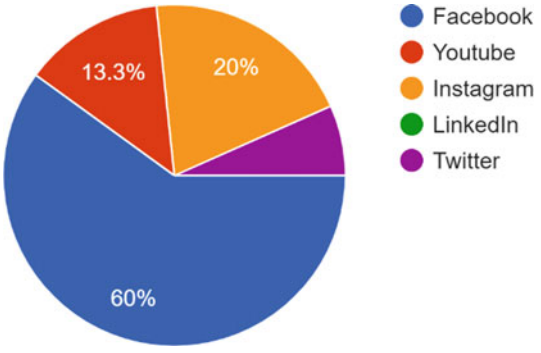

Fig. 3 Best platform for social media marketing among digital marketing experts

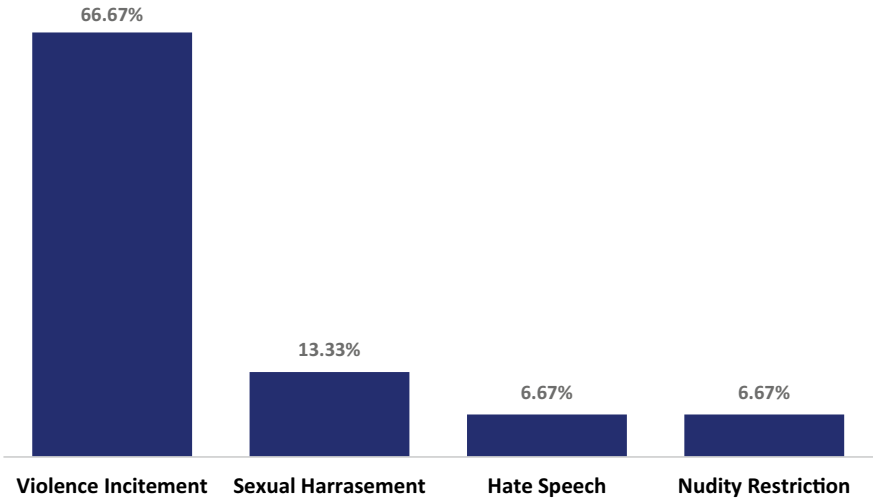

Fig. 4 Most beneficial social media regulation among digital marketing experts

than 66% of the participants believe that violence incitement is the most effective and beneficial regulation for social media users. Around 13% believe that sexual harassment-related regulations are beneficial for social media regulations. And the remaining participants believe that the nudity restriction and hate speech-related regulations are the most effective and beneficial, as shown in Fig. 4.

In addition to this, most of the participants believe that the social media regulations are not an attack on the freedom of speech, and they also believe that the termination of U.S. Ex-President Donald Trump's social media accounts is not against the freedom of speech, as shown in Fig. 4. They further reported that the termination of the Ex-President's social media accounts, Twitter and Facebook accounts, are as per the regulations of Twitter and Facebook. In the meantime, 13% of the participants believe that the termination of Trump's social media account is against the freedom of speech, as shown in Fig. 5. Most of the participants are also favoring the regulations of social media concerning digital marketing. They believe social media regulations will positively affect digital marketing. Most of them said the regulations like violence incitement, hate speech, data privacy, nudity, sexual harassment, etc., are playing a most influential role in digital marketing development. By implementing these regulations, users feel more secure to use these social media platforms, and they spend more time on these platforms and share more content; new users are also adding to these platforms. This is a good sign for digital marketing, and the marketing content will reach more people make marketing more effective.

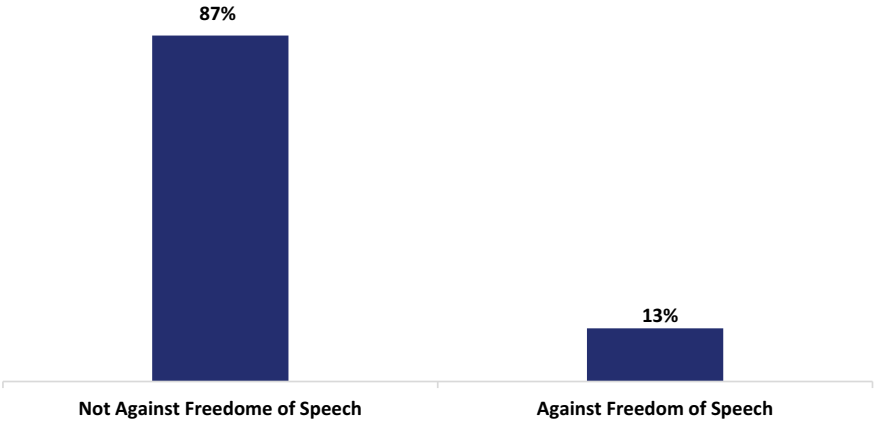

Fig. 5 Participants responses on the termination of Trump's Twitter and Facebook accounts

6 Discussions

In this research, digital marketing and the effects of social media regulations on digital marketing have been studied. It has been noticed that digital marketing is the mandatory way to market a business in the modern era (Abed et al., 2015, 2016; Felix et al., 2017; Shareef et al., 2019; Shiau et al., 2017). However, it has some problems; the most important way of digital marketing is social media marketing. In recent times, social media get subsequent fame among the public, and most people use that is why people social media marketing is the best way to promote a product/services. Moreover, the digital marketers also confirmed the social media marketing is way more beneficial than conventional media and other digital marketing ways. The digital marketers also found that the most beneficial platform for social media marketing is Facebook. There are more than a hundred million business-related pages, while 88% of the global businesses utilize Twitter for marketing. (Lister, 2018).

On the other hand, it is also found that social media platforms are used for cyber-bullying, violence incitement, nudity, sexual harassment, and much other non-ethical content. In this connection, social media platforms developed a series of regulations, and they decided not to allow anyone to use their platform for violence incitement, cyber-bullying, etc. In recent times, Ex-President Trump was found to incite violence in the USA's people to attack Capitol Hill and the social media giants, Facebook and Twitter, terminated his accounts. In response, Trump questioned them with the allegation to keep him away from his right to freedom of speech. This becomes a debate in the world, and in this research, we also asked about the experts of social marketing, and most of them confirmed that Donald Trump had shaken the regulations of social media. As a result, they terminated their accounts. There is nothing against freedom of speech, both of the platforms are private social media companies, and they have taken action against their user who violated their regulations. However, this raised a question on the survival of digital marketing; it might be possible that with the

strict implementation of regulations, social media users will leave the use of these platforms, and this will cause a reduction in public engagement, which produce abrasive effects on digital marketing. This question was also asked from the digital marketing experts in this research, and the responses from the experts were quite positive. They said social media regulation does not affect digital marketing negatively; even social media regulations have an intensely positive effect on digital marketing. The social media regulations stopped the violence, nudity, sexual harassment, and safety of private data; this brings new confidence in consumers, and they are using these social media platforms more frequently and for more time duration. As per the experts, the violence incitement controlling regulation is the most appreciated regulation, followed by the sexual harassment controlling regulations. These provide a new charm in social media and digital marketing.

7 Conclusion

Digital Marketing and its relationship with the social media regulations implementation has been studied in this research. Experts asked about the effects of social media regulations on digital marketing and found that social media regulations positively affect digital marketing. People are appreciating the social media regulations and using these platforms more frequently. While the experts are also asked regarding the regulations and freedom of speech with the example of Ex-President of USA, they responded that there is not any violation of the right of freedom of speech. These regulations of social media bring a new shine towards the rise of digital marketing. In this research, the original research purpose has been achieved; it is found that Trump's account termination is not an act of keeping him away from freedom of speech; on the other hand, it is also determined that there are beneficial relationships among the new social media regulations and digital marketing. These regulations will enhance the reach of digital marketing and make it more effective.

8 Practical Application

The outcome of this paper can assist digital marketers, business owners, and future research regarding the impact of social media regulations on digital marketing. Business owners and digital markers will understand these regulations will enhance digital marketing reach by attracting more users. There was also a research gap regarding this topic, and this research is also going to fill that research gap and assist future researchers.

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9 Future Recommendations

The use of social media and e-commerce is increasing day by day, and this will also increase the values of digital marketing, and social media marketing will be used exponentially to reach the marketing limit. However, another crucial factor regarding social media regulations is 'Local Government Social Media Regulations.' In the future, the effects of local government social media regulations should be involved in the research and find that either the local social media regulations can affect them adversely or effectively to digital marketing.

10 Limitations

- This research is limited to the five social media platforms, namely, Facebook, YouTube, LinkedIn, Twitter, and Instagram.
- It is just limited to the point of view of the United Arab Emirates digital marketing firms.
- It has another limitation that there is a limited number of organizations participated and with their limited responses.

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The Impact of Facebook Advertisements on Customer Attentions of Jordanian Female Young Users

Younes Megdadi, Mohammad Hammouri, and Zaid Megdadi

Abstract This research aimed to investigate the impact of facebook advertisements on customer attentions of Jordanian female young users. Analytical descriptive approach was used. A suitable sample used which includes of (400) young female customer users. The researchers used the questionnaire as a tool for collecting primary data. The results found that there is an impact of the facebook advertisements by facebook on customer attentions of Jordanian young female users. The researchers set up a number of recommendations and the most is acquired more advertisements with different design and entertainments to influence customer's attentions positively toward their personal products.

Keywords Facebook · Advertisements · Customer attentions · Jordanian female young

1 Introduction

Due to the technological development and the diversity of means of communication with customers, electronic advertisements for the marketing of companies' products have become dependent on social media networks, as they are networks that work on the interaction of members with each other, and at the same time they are considered a means of concern with the requirements of their personal lives. Hence, companies

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_10

have noted the importance of social media networks in marketing work, including the Facebook network because of the benefits it enjoys on the personal and social level for customers for the purposes of advertising their products, not to mention what Facebook enjoys such as speed of spread and flexibility in dealing with advertising and its content, and controlling the number Advertising times, ease of directing the advertisement to the target groups, ease of customer opinion poll taking into account all the comments, opinions and suggestions of customers towards the advertised products, the flexibility of designing the content of the advertisement in terms of images, videos and sounds, and the ease of identifying the details of the advertised products, which makes it easier to influence customers attentions positively, in addition to that, customer's will be able to compare with competing goods. Companies realized the importance of Facebook advertisements benefits for customers for different age groups, and ease to identify and allocating target customers to influence them positively.

2 Research Problem

Facebook ads have become one of the main and important means for companies to market their products to influence the generation of customers' attention towards the advertised products. This research seeks to examine the impact of Facebook ads on the attention of young female users who are users.

2.1 Research Conceptual Framework

The use of Facebook as one of the most common tool of social networks, which widespread use through electronic advertisements which aim to give young customers an attension by the marketed products of business firms and as one of the major network used by young users in Jordan, which noticed that there is a real problem in the marketing process of its various products, which has become directed towards electronic advertisements messages through Facebook network as one of the modern technological means in giving customers attension towards business firms products to improve their marketing performance.

2.2 Research Questions

The main question: Is there an impact of Facebook advertisements by its sub-dimensions (advertisement content, advertisement design, advertisement artistic production, and advertisement entertainments) on the attention in its combined

dimensions (perception, interest, desire, and preference) among young female's users? It is divided into the following sub-questions:

1. Is there the impact of Facebook advertisement by its sub-dimensions (advertisement content, advertisement design, advertisement artistic production, and advertisement entertainments) on the perception of young female's users?
2. Is there the impact of Facebook advertisements by its sub-dimensions (advertisement content, advertisement design, advertisement artistic production, and advertisement entertainments) on interest of female's users?
3. Is there the impact of Facebook advertisements by its sub-dimensions (advertisement content, advertisement design, advertisement artistic production, and advertisement entertainments) on the desire of female's users?
4. Is there the impact of Facebook advertisements by its sub-dimensions (advertisement content, advertisement design, advertisement artistic production, and advertisement entertainments) on the preference of female's users?

3 Research Hypotheses

Main hypothesis (H0): There is no statistically significant impact at the significance level ($0.05 \geq \alpha$) of Facebook advertisements by its sub-dimensions (advertisement content, advertisement design, advertisement artistic production, and advertisement entertainments) on attention by its dimensions (perception, interest, desire, and preference) of young females? The following sub-hypotheses stem from it:

(H01): There is no statistically significant impact at the significance level ($0.05 \geq \alpha$) of Facebook advertisements by its sub-dimensions (advertisement content, advertisement design, advertisement artistic production, and advertisement entertainments) on the perception of young females?

(H02): There is no statistically significant impact at the significance level ($0.05 \geq \alpha$) of Facebook advertisements by its sub-dimensions (advertisement content, advertisement design, advertisement artistic production, and advertisement entertainments) on the interest of young females.

(H03): There is no statistically significant impact at the significance level ($0.05 \geq \alpha$) of Facebook advertisement by its sub-dimensions (advertisement content, advertisement design, advertisement artistic production, and advertisement entertainments) on the desire of young females?

(H04): There is no statistically significant impact at the significance level ($0.05 \geq \alpha$) of Facebook advertisement by its sub-dimensions (advertisement content, advertisement design, advertisement artistic production, and advertisement entertainments) on the preference of young females.

4 Research Model

Based on previous studies, the researchers formulated a hypothetical model for the research and based on previous studies related to this research.

4.1 Discussion of the Proposed Model

As showed in Fig. 1, the researchers proposed the Facebook advertisements messages by a number of sub-dimensions were as (advertisement content, advertisement design, advertisement artistic production, and advertisement entertainments) on young customers attention by a number of sub-dimensions were as (perception, interest, desire, and preference) to help business firms of influencing customers attention toward business firms products and performing marketing activities efficiently and with less cost, by enhancing the efficiency of the used social media tools to communicate with potential customers as far as the young customers. It also used in data analytics which helps the operations as well; research data and results can be powerfully used by decisions makers of business firms for a better future of performing marketing activities by using social media network as far as Facebook.

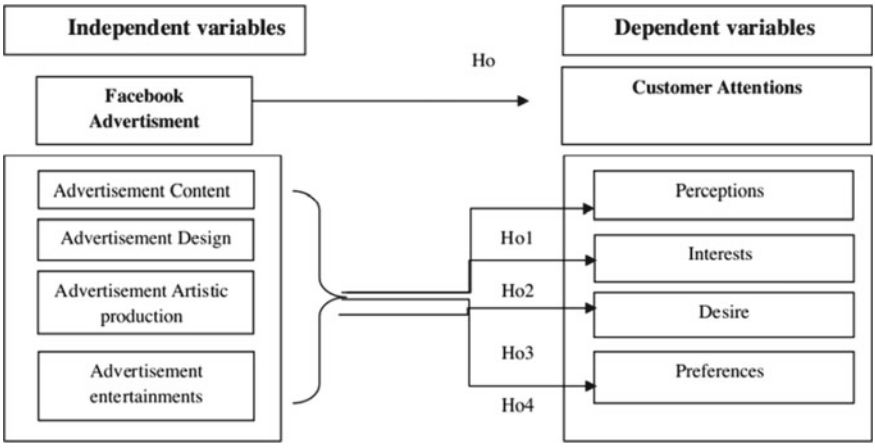

Fig. 1 Research model

5 Theoretical Background and Literature Review

5.1 The Concept of Electronic Advertising

There are several advantages to electronic advertising, the most important of which are: delivering the company's message to millions of people, establishing permanent and continuous relationships with customers, lowering the cost of electronic advertising due to the absence of printing and production costs, easy access to information and data in detail about the product, and the possibility of direct purchase from the site. The actions of customers and obtaining continuous feedback. Using technical methods and various technical media to draw the viewer's attention. The possibility of knowing the extent to which consumers accept new products and services. Knowing the impact of the advertising campaign first-hand and knowing the efficiency and effectiveness of advertising and linking it to the level of costs. And making any adjustments directly and quickly, and the ability to control the way the ad appears, as you can specify its appearance for its target group, a specific time, or a specific day. Increasing product recall rates by customers, mental enhancement of the brand name and trademark among consumers, and the ability to enter the company's website with just one click (Boyd & Ellison, 2008).

Electronic advertising takes many forms on the Internet, the most important of which is ads on social networks, which are ads that appear to users of social networking sites while they browse them, for example, the funded ads that appear on Facebook, which the user often does not follow these pages, or Twitter ads or YouTube ads that are Mandatory in some sections. The advertisement through the account of a famous person on social networking sites (influencers): which is for a company to agree with some personalities that have a large number of followers on its accounts on social networking sites to make paid ads to promote its products and take advantage of the large number of followers it has (Scott et al., 2007).

Facebook is a social network that communicates and interacts between members to share their thoughts, feelings, pictures, and videos that belong to them, and this makes it one of the most important marketing tools for companies (Fazalur et al., 2014).

The artistic output of the electronic advertisement has been known as an integrated technical unit that both the advertisement designer and director contribute to its preparation and manufacture, in order to reach the advertising idea to be presented to consumers in order to attract attention and draw attention to these electronic advertisements. This depends on the use of all components of digital images, drawings, lines and colors in an optimal and homogeneous way to come out to the consumer audience in a wonderful way because the artistic output of electronic advertisements is not a goal but rather a means aimed at highlighting the contents of the advertisement in a way that helps draw consumer attention and arouse interest, and then reach the purchase decision-making (Al-Junaid, 2017).

The text of the advertisement has been known as composing digital texts with the aim of promoting a company, person, product, opinion or idea, and the main goal

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of writing this text is to persuade the consumer to buy the product or subscribe to the service or to pay for a specific idea, behavior or belief, and includes the texts of the electronic advertisement The various pillars of advertising, from the structure of the literary text and the title to the logo, in addition to direct e-mail messages or advertisement songs, and the text of digital advertisements, and the writers of electronic advertising texts use methods to choose words that are entitled to the best ranks in the search engines. This is done by choosing strategic words and repeating key words and phrases on the pages of the sites, it has become the duty of the writer of electronic ads to attract the words of the search engines, and hold them with an advanced rank, not to mention that it captivates the website visitors from the consumers (Heath, 2012).

The characteristics, type, and duration of the electronic advertisement display and the nature of the sites on which the advertisement appears is able to perceived quality of the commodities appearing in this advertisement (Abu Kharma et al., 2011). The electronic advertising has a positive impact in terms of (electronic advertising characteristics, the content of the e-mail, the mental image of the electronic advertisement, and the electronic advertising medium) combined in influencing the purchasing behavior of the Jordanian youth consumer of cars (Hassan, 2015).The electronic advertising has an effect on consumer behavior, but this effect is in the behavioral stages, attention, interest and desire, but there is no effect on the buying process (Ibrahim, 2017). High percentage of respondents stated that the quality of information provided by electronic advertising plays a role in influencing the attitudes of individuals, and electronic advertising works on appealing to the individual, and inciting feelings of experimenting with the services of the institution (Belakahleh, 2017).

A positive relationship between the AIDA model and the effectiveness of advertising in private insurance companies, and as the study recommended and one of the most important of them is that private insurance companies should add the AIDA model to their advertising strategies (Gharibi, 2012). The majority of individuals access ads on Facebook and see that they target youth, and the results also showed that (54.8%) interact with the ads they receive on Facebook, and that (45.2%) do not interact with them (Ago, 2015). The information and entertainment in advertisements through social media have a significant impact on awareness of the products offered (Abuhashesh et al., 2021; Al Kurdi & Alshurideh, 2021; Rahim, 2015).

5.2 Research Approach

This research relied on the descriptive approach. This approach was used to review the most important literature related to the impact of Facebook ads on the attention of female users of social networks.

5.3 Research Population and Study Sample

The population of the research consisted of the Jordanian youth group whose ages ranged between (18–40 years) and their total number was (54,662,3) young of both genders in according to the report of the Department of Statistics for the year (2020). A random sample was selected from all governorates of the Kingdom with total (400) female.

5.4 Research Tool and Validation

The research tool was developed that covered all variables with its independent and dependent dimensions, and it was judged by specialists in scientific research according to the aim and purpose of the research. The statistical standard and its percentage (80%) were adopted to indicate the validity of the paragraph, based on the opinions of the arbitrators. The researchers considered the opinions of young females and their amendments as an indication of the validity of the content of the research tool.

Table 1 shows the results of Cronbach alpha coefficient values to all sub-dimensions of the independent and sub-study variables ranged, and the scale as a whole were higher than (0.60), which is acceptable ratios based on the current research purposes.

Table 1 Alpha Cronbach test

Ind. & Dep. variables	Cronbach's alpha coefficient result
Facebook Advertisments	
Advertisement content	0.821
Advertisement design	0.744
Advertisement artistic production	0.771
Advertisement entertainments	0.841
Customer attentions	
Perception	0.811
Interest	0.845
Desire	0.799
Preference	0.778
Overall	0.802

5.5 Data Analysis: Descriptive Statistics Results

First: The arithmetic averages and standard deviations were extracted to identify the responses of respondents about the level of Facebook ads dimensions.

Table 2 shows that the arithmetic averages of the level of Facebook ads. dimensions ranged between (4.20–4.45), with an average of (4.29) which indicates a high degree. Advertisement entertainments it was in the first rank, with arithmetic mean of (4.45) and standard deviation of (0.69) which indicates a high degree and in the least rank is advertisement design with arithmetic mean of (4.20), and standard deviation (0.58), which indicates a high degree. The overall arithmetic mean of Facebook advertisements dimensions indicate (4.29) with standard deviation of (0.64) which indicates a high degree.

Second: The arithmetic averages and standard deviations were extracted to identify the responses of respondents about the level of customer's attentions dimensions.

Table 3 shows that the overall arithmetic averages of the level of customers' attention ranged between (4.28–4.44), with average of (4.36) with a high degree. Interest dimension was ranked no. 1, with an arithmetic mean of (4.44), with standard deviation of (0.77) which indicates a high degree. The least dimension was preference with an arithmetic mean of (4.28), with standard deviation of (0.63), which indicates a high degree. The overall arithmetic mean of (4.36), with standard deviation of (0.69) which indicates a high degree. This indicates that the customer's attentions is high.

Table 2 The arithmetic averages and standard deviations of Facebook ads. dimensions

No	Facebook advertisements	Mean	S.D	Rank	Degree
1	Advertisement content	4.28	0.67	2	High
2	Advertisement design	4.20	0.58	4	High
3	Advertisement artistic production	4.22	0.61	3	High
4	Advertisement entertainments	4.45	0.71	1	High
	Overall	4.29	0.64		High

Table 3 The arithmetic averages and standard deviations of customer's attentions dimensions

No	Customers attentions	Mean	S.D	Rank	Degree
1	Perception	4.36	0.69	2	High
2	Interest	4.44	0.77	1	High
3	Desire	4.34	0.67	3	High
4	Preference	4.28	0.63	4	High
	Overall	4.36	0.69		High

Table 4 .

Facebook advertisements	B	S.D	Beta	t. value	Sig
Advertisement content	0.452	0.045	0.489	10.675	0.000*
Advertisement design	0.134	0.048	0.145	2.776	0.000*
Advertisement artistic production	0.192	0.032	0.234	4.766	0.000*
Advertisement entertainments	0.145	0.036	0.196	4.664	0.000*

* Statistically significant at ($0.05 \geq \alpha$) level (t) tabular value = ($\pm$ 1.96)

5.6 Research Hypotheses Tests

(Ho): Multiple regression analysis test was used in order to identify the impact of Facebook advertisements by its dimensions (advertisement content, advertisement design, advertisement artistic production, and advertisement entertainments) on customers attentions by its dimensions (perception, interest, desire, and preference) of young females users. Table 4 illustrates this:

Table 4, following the (t) test values that the sub-variables related to Facebook ads with their dimensions (advertisement content, advertisement design, advertisement artistic production, and advertisement entertainments) had an impact on customers attention of female youth customers, as the values of (t) calculated for the three dimensions reached (10.675, 2.776, 4.766 and 4.664) respectively, which are significant values at ($0.05 \geq \alpha$) significance level, and it was found that all dimensions had an impact on the attention of young females customers using the Facebook network (Table 5).

Stepwise Multiple Regression analysis used to determine the importance of each independent variable separately in contributing to the model that represents the effect of the characteristics of Facebook ads on the attention of young female customers users of Facebook, as it is clear that the order of entry of the independent variables into the regression equation, The advertisement entertainment dimension came in the first place and explained of (72.2%) of the variance in the dependent variable, and the second dimension is advertisement content, and explained of (73.4%) of the variance in the dependent variable, and the third dimension is advertisement artistic production

Table 5 Results of stepwise multiple regression analysis to predict the attention span of females using Facebook

Model	The of entry of the independent sub-variables into the prediction equation	Value R^2	Value (F)	Sig
1	Advertisement entertainments	0.722[a]	388.210	0.000*
1 + 2	Advertisement content	0.734[b]	245.258	0.000*
1 + 2 + 3	Advertisement artistic production	0.742[c]	162.224	0.000*
1 + 2 + 3 + 4	Advertisement design	0.748 [d]	144.376	0.000*

*Statistically significant at ($0.05 \geq \alpha$) level (t) tabular value = ($\pm$ 1.96)

with the previous variables and explained of (74.2%) of the variance in the dependent variable, and the fourth dimension is advertisement design with the previous variables and explained of (74.8%) of the variance in the dependent variable. Accordingly, the null hypothesis is rejected, and the alternative hypothesis is accepted, meaning that there is a significant impact. Statistical significance at the level of significance ($0.05 \geq \alpha$) for Facebook ads by (advertisement content, advertisement design, advertisement artistic production, and advertisement entertainments) on customers' attention in its dimensions (perception, interest, desire, and preference) among young females who use the Facebook network.

(H01): There is no statistically significant impact at the level of significance ($0.05 \geq \alpha$) for Facebook ads on young female's perception of Facebook users. Multiple regression tests were used for knowing the impact of Facebook ads in their dimensions (advertisement content, advertisement design, advertisement artistic production, and advertisement entertainments) on young female customer's perception, and Table 6 illustrates this:

Table 6, shows that the (t) test values is related to Facebook ads with its dimensions (advertisement content, advertisement design, advertisement artistic production, and advertisement entertainments) had an impact on young female perception, as the values of (t) calculated for the three dimensions reached (16.234, −1.229, 4.344 and 4.677) respectively, which are significant values at ($0.05 \geq \alpha$) significance level, and it was found that all dimensions had an impact on females customers perceptions who use the Facebook network.

(H02): There is no statistically significant impact at the significance level ($0.05 \geq \alpha$) of the Facebook ads on the interest of young female users. Multiple regression tests were used in order to identify the impact of Facebook advertisements by its dimensions (advertisement content, advertisement design, advertisement artistic production, and advertisement entertainments) on young female customers interest, and Table 7 illustrates this:

Table 7, shows that the (t) test values is related to Facebook ads with their dimensions (advertisement content, advertisement design, advertisement artistic production, and advertisement entertainments) had an impact on young female interest, as the values of (t) calculated for the three dimensions reached (5.568, 2.213, 4.567 and 4.544) respectively, which are significant values at ($0.05 \geq \alpha$) significance level, and it was found that all dimensions had an impact on young females interest who use the Facebook.

Table 6 .

Facebook advertisements	B	S.D	Beta	t. value	Sig
Advertisement content	0.812	0.048	0.712	16.234	0.000*
Advertisement design	−0.069	0.058	−0.066	−1.229	0.191
Advertisement artistic production	0.166	0.039	0.171	4.344	0.000*
Advertisement entertainments	0.148	0.038	0.196	4.677	0.000*

*Statistically significant at ($0.05 \geq \alpha$) level (t) tabular value = (±1.96)

Table 7 .

Facebook advertisements	B	S.D	Beta	t. value	Sig
Advertisement content	0.254	0.051	0.289	5.568	0.000*
Advertisement design	0.112	0.048	0.131	2.213	0.028*
Advertisement artistic production	0.154	0.036	0.221	4.567	0.000*
Advertisement entertainments	0.148	0.036	0.196	4.544	0.000*

*Statistically significant at ($0.05 \geq \alpha$) level (t) tabular value = ($\pm$ 1.96)

(H03): There is no statistically significant effect at the significance level ($0.05 \geq \alpha$) of the Facebook ads on young female's desire. Multiple regression tests were used in order to identify the impact of Facebook advertisements by its dimensions (advertisement content, advertisement design, advertisement artistic production, and advertisement entertainments) on young female desire, and Table 8 illustrates this:

Table 8, shows that the (t) test values is related to Facebook ads with its dimensions (advertisement content, advertisement design, advertisement artistic production, and advertisement entertainments) had an impact on young female desire, as the values of (t) calculated for the three dimensions reached (5.775, 2.453, −1.498 and 4.632) respectively, which are significant values at ($0.05 \geq \alpha$) significance level, and it was found that all dimensions had an impact on young females desire who use Facebook.

(H04): There is no statistically significant effect at the significance level ($0.05 \geq \alpha$) of Facebook ads on young females preferences. Multiple regression tests were used in order to identify the impact of Facebook advertisements by its dimensions (advertisement content, advertisement design, advertisement artistic production, and advertisement entertainments) on young female preferences, and Table 9 illustrates this:

Table 9, shows that the (t) test values that is related to Facebook ads with their dimensions (advertisement content, advertisement design, advertisement artistic production, and advertisement entertainments) had an impact on customers preferences of female youth customers, as the values of (t) calculated for the three dimensions reached (6.441, 2.545, 4.672 and 4.559) respectively, which are significant values at ($0.05 \geq \alpha$) significance level, and it was found that all dimensions had an impact on females customers preferences who use the Facebook.

Table 8 .

Facebook advertisements	B	S.D	Beta	t. value	Sig
Advertisement content	0.254	0.051	0.289	5.775	0.000*
Advertisement design	0.112	0.048	0.131	2.453	0.000*
Advertisement artistic production	−0.144	0.095	−0.092	−1.498	0.129
Advertisement entertainments	0.148	0.036	0.046	4.632	0.000*

*Statistically significant at ($0.05 \geq \alpha$) level (t) tabular value = ($\pm$ 1.96)

Table 9 .

Facebook advertisements	B	S.D	Beta	t. value	Sig
Advertisement content	0.266	0.054	0.299	6.441	0.000*
Advertisement design	0.121	0.046	0.142	2.545	0.000*
Advertisement artistic production	0.157	0.089	0.066	4.672	0.000*
Advertisement entertainments	0.151	0.041	0.052	4.559	0.000*

*Statistically significant at ($0.05 \geq \alpha$) level (t) tabular value = (± 1.96)

6 Findings

- The arithmetic averages of the level of Facebook advertisements dimensions it was high, that the arithmetic averages of the level of Facebook ads dimensions ranged between (4.20–4.45), with an average of (4.29) which indicates a high degree. The overall arithmetic mean of Facebook advertisements dimensions indicate (4.29) with standard deviation of (0.64) which indicates a high degree.
- The arithmetic averages of the level of customers' attention dimensions ranged between (4.28–4.44), with average of (4.36) which indicates a high degree. The overall arithmetic mean of (4.36), with standard deviation of (0.69) with a high degree. This indicates that the customer's attentions is high.
- Facebook ads by its dimensions (advertisement content, advertisement design, advertisement artistic production, and advertisement entertainments) had an impact on young female's attention, as the values of (t) calculated for the three dimensions reached (10.675, 2.776, 4.766 and 4.664) respectively, which are significant values at ($0.05 \geq \alpha$) significance level, and it was found that all dimensions had an impact on the attention of young females using Facebook.
- Advertisement entertainments it was ranked number one with a high degree by Facebook were characterized as harmony between sound and image, which increases the attentions of young female users by Facebook depends on the reality of the markets and the characteristics of young females. Facebook advertisements enjoys modernity in terms of choosing the appropriate colors, shapes and sounds according to the characteristics and characteristics of the customers to have a clear impact on the customers' response (Aljumah et al., 2021; Al-Maroof et al., 2021; Almazrouei et al., 2020; Alshurideh et al., 2019)
- There is an impact of Facebook advertisements on the perceptions of young female users, and it has also been found that the ads content contains all information about the products trademark, trade name, values, quality, and specifications in a way that is striking in attentions (Khasawneh et al. 2021a, b; Kurdi 2021).
- There is an impact of Facebook advertisements on young females attentions towards the advertisement artistic production due to its ability to build and change the convictions of young female positively towards the advertising products to help them of perceiving, interesting, desirable, and selecting the favorable products they prefer.

- There is an impact of Facebook advertisements on young female's attentions towards the advertisement design based on young female characteristics in terms of age, attitudes, behaviours, and culture to ensure the attention ability of them towards the advertisements, and to help them to become more interested of following up Facebook advertisements as one of the famous social media used recently by business and marketers for promoting products with ease of customer's reachability at any time.

7 Conclusion

Business firms and marketing managers require understanding carefully the young customers attention by Facebook advertisements messages on the bases of messages by a number of sub-dimensions were as (advertisement content, advertisement design, advertisement artistic production, and advertisement entertainments) on young customers attention by a number of sub-dimensions were as (perception, interest, desire, and preference).

Business firms and marketing managers require to follow up young customers to design a number of advertising strategies to match young customers as one of biggest target segment by several business firms' products to persuade and changing their perceptions positively to help them of purchasing advertised products.

8 Research Limitations

Based on the results that have been reached, the researcher provides a number of recommendations were as: Marketing management required to pay more attention for young customers' females users of Facebook advertisements to influence and to attract them positively to become a regular followers for products advertisements concerning young female's customers, and marketing management required to pay more attention to young female's customers' perceptions, interests, desires, and preferences toward products advertisements to influence their attitudes and behaviours positively, and marketing management required to pay more efforts for developing advertisements content, design, artistic production, and entertainments to match young customers' female personal characteristics in bases of cultures, values, habits, personal interest, and life styles, and marketing management required to update the advertisements content in regard to products information in terms of the trade name and trade mark, products values and benefits, using products informations to keep young female customers aware of product knowledge which is a basic for advertisements credibility and preferences, and marketing management required to ensure young female customer's privacy and response to adopt Facebook advertisements easily.

9 Future Implications

Conducting several future studies that will address other dimensions of Facebook Advertisements as far as advertisement applications, online shopping, online in different environments with different population and samples.

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The Impact of Social Media on Purchase Intention at Jordanian Women Clothing Sector

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Abstract The aim of the study was to examine the impact of social media on purchase intention. Therefore, it focused on Jordan-based companies operating in the women clothing sector. Data were primarily gathered through self-reported questionnaires created by Google Forms which were distributed to a random sample of (384) responses. In total, (370) responses were received including (6) invalid to statistical analysis due to uncompleted or inaccurate. Hence, the final sample contained (364) responses suitable to analysis requirements that were formed a response rate of (94.80%). structural equation modeling (SEM) was conducted to test hypotheses. The results showed that social media dimensions had a positive impact on purchase intention. Moreover, the results indicated that the highest impact was for Sharing Contents. Based on the previous results, the current study recommends organizations in the clothing sector to pay attention to social media and take advantage of

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_11

it in advertising and marketing for the women's clothing sector in Jordan, due to the impact of these sites on the purchase intention of consumers, emphasizing the importance of clarifying all information for products.

Keywords Social media · Purchasing intention · Clothes sector · Jordan

1 Introduction

Social media has become a contemporary phenomenon; As companies began to expand the operations of offering their products and marketing operations based on these media as one of the tributaries of their revenues, the great development in the Internet has provided these media with wide opportunities for the spread and promotion of advertisements for companies of all kinds, and thus helped their users to know the contents of advertisements for different companies, and organizations that provides detailed information for each of its products and services (Al-Hawary & Alhajri, 2020; Al-Hawary & Obiadat, 2021; Altarifi et al., 2015). Sanad (2019) believes that for the maximum benefit of these media, it is necessary to understand what is meant by social media, and how to apply it in many ways. Social media is distinguished from the various sites on the Internet in its ability to enable customers to produce, publish and criticize and help them classify content and interact with it online.

By studying the intent to purchase, social media has played an important role in searches, discovering new customers, and identifying the desires and needs of existing customers, and it also constitutes an opportunity to discover as much information as possible about what interests companies or customers, such as: buying a product, or Searching for job opportunities, or learning about content for the purpose of browsing only to learn about their content (Al-Hawary & Harahsheh, 2014; Al-Hawar & Al-Menhaly, 2016; Al-Hawary & Al-Smeran, 2017; Al-Hawary & Hussien, 2017; Alolayyan et al., 2018;). The use of social media as a marketing channel has spread, as organizations have found several ways to send advertising messages through social media. Advertising is used through private user content in social media, through the advertiser finding a link between the advertisement in social media and the company's website (Abuhashesh et al., 2021; Al Kurdi et al., 2021; Al-Nesour et al, 2016; Alshurideh et al., 2017a, b).

Reviewing the managerial literature related to the intention of purchasing, and social media, finds that there is ambiguity in the knowledge of the role of social media in determining the intent to purchase in the women's clothing sector in Jordan (Al-Hawary, 2013; Al-Hawary et al., 2013). It emerges through conducting research and presentation of previous studies, that there are paradoxes about the interpretation of the content of these variables, which indicates that there is a cognitive problem that requires preparation and setting scientific and cognitive determinants for it; therefore, this study contributes to the preparation of an intellectual and theoretical framework for the topics of the study, and works to provide a scientific contribution to

its variables, and to contribute to the enrichment and strengthening of Arab libraries that lack research and studies on the subject of intention to purchase, and social media, which may open new ways for researchers in this topics.

The problem of the study lies in knowing the motives behind the purchase intent of customers in the women's clothing sector in Jordan, by using social media, and identifying the factors affecting purchase intent; Social media has evolved to become effective media that allows users to interact and communicate with acquaintances and friends (Al-Alwan, 2018; Aljumah et al., 2021; Khasawneh et al., 2021a, b; Kurdi et al., 2021). The number of social media users has become very large, and thus advertisers and marketers have alerted to the need to use these media to market their products, and to introduce their customers to their various products, and thus benefit by increasing their sales, and gaining larger numbers of customers by revealing their image in front of customers and stimulating customers' intention to buy and in the end maximizing its profits (Al-Hadithi, 2017; Almazrouei et al., 2020; Al-Maroof et al., 2021).

This study attempts to contribute to spreading the importance of social media in the work environment, which leads to an increase in the awareness of the competent parties and becomes more knowledgeable about their work. It also provides assistance to managers and workers in the Jordanian women's clothing sector in the field of detecting strengths and weaknesses and identifying the elements that affect the intention of e-purchasing, and social media. This study seeks to present a simple effort and a qualitative addition to the practical side of the strategic thinking of organizations, by revealing the impact of social media on purchasing intention in the women's clothing sector in Jordan.

2 Theoretical Framework and Hypothesis Building

2.1 Social Media

The emergence of social media has completely changed the world and the way it works and has brought people of all cultures and nationalities closer to each other, and the previous year's witnessed a remarkable investment by companies in Internet marketing operations through social media to advertise their services and products such as the following sites: Instagram, Twitter, Facebook as modern advertising platforms that allow individuals to communicate with each other. Social media is distinguished from other sites in its ability to enable users to produce, criticize, categorize, publish and interact with content over the internet (Khasawneh et al., 2021b; Tariq et al., 2022a, b). Thus enabling them to interact directly and exchange information, which makes these media a very popular and desirable feature, as their widespread spread made institutions seek to maintain their sites in social media by promoting their products, and working to find various modern methods to interact with their customers, and build relationships positive interaction with social media

users, and the interaction of individuals via social media sites provided a new behavior that affected the purchasing intentions of consumers, as a new and useful platform for providing information. (Al-Nusour et al., 2016; Alshurideh, 2022; Mohammad et al., 2020).

There are many definitions of the concept of social media, and it is defined as a set of electronic systems that enable Internet users to create their own pages, and their ability to link them with other members through electronic social systems; to share products, information, and services as well as a variety of issues (Qaseem et al., 2018). Thabet (2017) defined social media as a number of web pages that facilitate interactions between members actively participating in social networks located on the Internet and that provide all the media that enables individuals to interact with each other and help them to do so. Sounia and Youssef (2017) defined social media as: a term that expresses a set of global networks that enable individuals to communicate with each other in virtual community environments; Where they are brought together by different links, such as interest or belonging to a class or country and studied or a specific group of the global system for the transmission of information and data. The researchers define social media as a group of websites on the Internet that allow individuals to create pages and groups and disseminate information on a large scale at the level of countries all over the world, through which it is possible to establish social and economic relations in addition to exchanging information and making purchases and sales through its various media which these sites provide easily.

Social media marketing is a new trend and a fast-growing way in which businesses reach their target customers easily, social media marketing can be defined simply as the use of social media channels to promote a company and its products, this type of marketing can be considered as a subset of online marketing activities that complement traditional web-based promotion strategies, such as email newsletters, online advertising campaigns, and encourage users to disseminate messages to personal contacts (Alwan & Alshurideh, 2022; Nadaraja & Yazdanifard, 2013).

There are many dimensions resulting from marketing through social media, the researcher believes that the dimensions of marketing through social media are summarized as follows; **Informatics**: Information is the primary material for making any decision, and the informatics system is meant as a homogeneous and interconnected group of business, and the elements that work to collect and control data, with the aim of producing and communicating useful information to decision makers through a network, lines and communication channels (Al-Sahn, 2007). **Interaction**: It is one of the most important concepts in the contemporary business world to ensure the survival of companies in the market, because marketers nowadays face many challenges due to technological efficiency, high competition, and the spread of market segmentation. The importance of interaction in the marketing process lies in the processes of education, educating the individual and giving him information to obtain services or goods that help change lifestyles and levels, and achieve various social benefits for the individual and society (Ahmad et al., 2020, 2021; Al-Hamad et al., 2021; Almaazmi et al., 2020; Alshurideh et al., 2019a, b). Reliability: reliability is one of the most important factors on which the quality of service depends in marketing, and fulfilling the credibility of services is the most important way

that facilitates the provision of services by organizations with their customers, that is, organizations that seek to achieve success are the ones who put the customer in mind first, and then provide all the necessary processes and activities to meet all the needs and desires of customers in the target markets. **Content sharing**: Creating and sharing valuable and informative content helps develop the brand, thus increasing the likelihood of success of the marketing campaign capabilities, especially those of the company and what it offers as well, to be published on the Internet afterwards and on various social media sites, bringing the content to the largest number of people interested by searching.

2.2 Purchasing Intent

Social media has contributed to adding a new concept to the intention of purchasing by directing users to social media to search for products and information about the product, and make purchasing decisions, as the main objective of marketing operations through social media sites is to achieve and satisfy the desires and needs of the consumer, and develop all products to meet the consumers need and achieve their satisfaction, and the success and prosperity of organizations is not limited to discovering the consumer requirements, but rather work with increasing effort to identify requirements and needs or other motives of intentions for making purchasing decisions (Akour et al., 2021; Al Dmour et al., 2014; Al-Nesour et al., 2016; Shishan et al., 2022).

This process requires careful analysis and a deep study of the motives and precise factors that drive the purchasing intention of consumers, where the concept of purchase intention can be defined as the presence of a need among consumers to be satisfied, and these needs differ either to be basic or non-essential. Services and goods are one of the basic means used to satisfy the needs and desires of prospective consumers, and the need for these products is discovered through the interaction of internal motives and external stimuli that generate a person's feeling of need (Abu Qaaud et al., 2011; Al-Hawary & Al-Khazaleh, 2020; Al-Hawary et al., 2017; Alshurideh et al., 2017a, b; Metabis & Al-Hawary, 2013; Qaseem et al., 2018). Purchasing intent is defined as the pattern or means by which the individual consumer in his behavior to evaluate, search for, purchase or use goods, ideas and services that are expected to satisfy his desires and satisfy his needs, and it can also be defined as a set of behaviors that include the purchase and use of services and goods. It also includes those that precede these behaviors and determine the movements that the individual consumer makes while making the purchase decision (Al-Nesour et al., 2016). The researchers define it as a set of behaviors and patterns followed by individual consumers to search for, evaluate, purchase or use goods that he believes may meet their needs and desires, through which he determines the behavior and movements of the individual when making a purchasing decision.

Many factors and variables play an important role in the purchasing intention of individual consumers, whether they are internal or external, that directly affect the

purchasing decision related to them. The most important of these factors that affect the purchasing intention of consumers are demographic factors (such as marital status, gender, race, and age)., where the purchasing behavior of females towards services and goods differs from the behavior of males and the behavior of the elderly consumer individuals differs from the behavior of the young consumers. The social status of individuals affects their purchasing behavior, as the marketer can identify the desires and needs of individual consumers and respond to them effectively according to demographic factors, which motivates the consumer to be more loyal and loyal to the marketing organization and the products issued by it, and this loyalty can be strengthened through promotional programs Directed and properly planned towards the needs and motives of the consumer, which is based on persuasion and influence on the intent of purchase, and the adoption of appropriate promotional methods that serve the objectives that the organization is trying to achieve (Al-Dmour et al., 2008; Kuester, 2012).

The changes that occurred in the behavior of consumers and the developments that resulted from the external environment led to the difference and multiplicity of factors affecting the purchasing decision, which made it difficult to study this behavior on consumers, and made institutions work to try to adapt to these factors and variables by distinguishing and diversifying their variables, whether in terms of prices or quality through Relying on distribution and advertising methods, in accordance with the capabilities of the organization and in a manner that suits the consumer, in response to the foregoing, it is clear that making the purchasing decision is not an easy process, but rather a complex process that passes through many stages, where the individual works after making the intention to purchase a particular product or service as a result of the urgency of the need or the necessity of its use, as he determines the possible alternatives to it that are presented to the Many sites and determine the specifications that he needs and the characteristics that distinguish each good or service from others, and many factors can be based in choosing the appropriate alternative such as price, quality and previous experiences of the consumer himself or the individuals surrounding him, and then he makes the purchase decision, and then the extent of customer satisfaction is determined about the service or product or not, it is worth noting that e-marketing has a very important role in making the purchasing decision, which works to attract consumers towards a specific commodity through the methods of contacts that work to entice them with the product and its specifications.

2.3 Social Media and Purchasing Intent

Social media has added a new concept to the intention of purchasing through the continuous increase in the quest to direct users towards social media in order to search for information and make purchasing decisions. Marketing through various activities has played a key role in achieving the satisfaction of the customer's needs and desires, and working to develop products to achieve customer satisfaction, so that the success of institutions is not limited only to discovering what the consumer

needs, but rather work doubly to determine the reasons for finding that need or other intentions and motives for decision-making, and this in turn requires an in-depth study and careful analysis of the internal factors, and motives that motivate the purchase (Abu Zayyad et al., 2021; Al-Nesour et al., 2016).

Social media helps increase customer satisfaction through retailers realizing the competitive advantage of using the internet, and many of them have adopted social media as a way to interact, engage and create value with customers. Many well-known electronic retail stores such as Amazon have gained experience to deal with customers and have become fully aware of the customer and what he needs. Many studies have addressed the importance of the role of these media in increasing customer and customer satisfaction and influencing their purchase intention**.** In light of the cause-and-effect relationship of online customer satisfaction and their intention to buy, and repeating purchases from the same retailer several times means the desire to get the same product, and this indicates a high satisfaction. In other words, the more satisfied customer is more likely to buy repeatedly in the same manner and method (Al-Adayleh, 2015). Accordingly, the study hypothesis can be formulated as follows:

There is a statistically significant effect of social media on purchasing intention in the Jordanian women's clothing sector.

3 Study model

See Fig. 1.

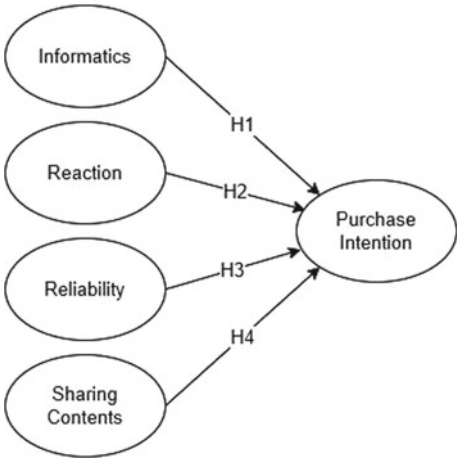

Fig. 1 Research model

4 Methodology

4.1 Population and Sample Selection

A qualitative method based on a questionnaire was used in this study for data collection and sample selection. The major aim of the study was to examine the impact of social media on purchase intention. Therefore, it focused on Jordan-based companies operating in the women clothing sector. Data were primarily gathered through self-reported questionnaires created by Google Forms which were distributed to a random sample of (384) responses. In total, (370) responses were received including (6) invalid to statistical analysis due to uncompleted or inaccurate. Hence, the final sample contained (364) responses suitable to analysis requirements that were formed a response rate of (94.80%), where it proved to be sufficient to the extent that was predictable and allowed for a presumption of data saturation (Sekaran & Bougie, 2016).

4.2 Measurement Instrument

A self-reported questionnaire that consists of two main sections along with a section regarding control variables was used as the measurement instrument. Control variables considered as categorical measures were composed of gender, age group, educational level, and experience. The two main sections were dealt with a five-point Likert scale (from 1 = strongly disagree to 5 = strongly agree). The first section contained (19) items to measure social media based on (Nadaraja & Yazdanifard, 2013). These questions were distributed into dimensions as follows: fiveitems dedicated for measuring informatics, fouritems dedicated for measuring reaction, fiveitems dedicated for measuring reliability, and fiveitems dedicated for measuring sharing contents. Whereas the second section included nineitems developed to measure purchase intentionaccording to what was pointed by (Kuester, 2012).

5 Findings

5.1 Measurement Model Evaluation

This study was conducted structural equation modeling (SEM) to test hypotheses, which represents a contemporary statistical technique for testing and estimating the relationship between factors and variables (Al-Adamat et al., 2020; Al-Gasawneh and Al-Adamat, 2020; Al-Hawary & Al-Syasneh, 2020; Al-Nady et al., 2016;

Table 1 Results of validity and reliability tests

Constructs	1	2	3	4	5
1. Informatics	**0.764**				
2. Reaction	0.415	**0.746**			
3. Reliability	0.366	0.364	**0.747**		
4. Sharing contents	0.391	0.458	0.381	**0.768**	
5. Purchase intention	0.625	0.597	0.604	0.622	**0.758**
VIF	1.834	1.552	2.341	1.784	–
Loadings range	0.694–0.864	0.612–0.802	0.671–861	0.733–0.816	0.581–0.841
AVE	0.584	0.557	0.559	0.590	0.574
MSV	0.441	0.512	0.419	0.381	0.451
Internal consistency	0.873	0.830	0.861	0.875	0.921
Composite reliability	0.875	0.833	0.863	0.878	0.923

Note Bold fonts indicate to square root of AVE

AlTaweel & Al-Hawary, 2021; Wang & Rhemtulla, 2021). Accordingly, the reliability and validity of the constructs were tested using confirmatory factor analysis (CFA) through the statistical program AMOSv24. Table 1 summarizes the results of convergent and discriminant validity, as well the indicators of reliability.

Table 1 shows that the standard loading values for the individual items were within the domain (0.581–0.864), these values greater than the minimum retention of the elements based on their standard loads (Al-Lozi et al., 2018; Sung et al., 2019). Average variance extracted (AVE) is a summary indicator of the convergent validity of constructs that must be above 0.50 (Howard, 2018). The results indicate that the AVE values were greater than 0.50 for all constructs, thus the used measurement model has an appropriate convergent validity. Rimkeviciene et al. (2017) suggested the comparison approach as a way to deal with discriminant validity assessment in covariance-based SEM. This approaches based on comparing the values of maximum shared variance (MSV) with the values of AVE, as well as comparing the values of square root of AVE ($\sqrt{}$AVE) with the correlation between the rest of the structures. The results show that the values of MSV were smaller than the values of AVE, and that the values of $\sqrt{}$AVE were higher than the correlation values among the rest of the constructs. Therefore, the measurement model used is characterized by discriminative validity. The internal consistency measured through Cronbach's Alpha coefficient (α) and compound reliability by McDonald's Omega coefficient (ω) was conducted as indicators to evaluate measurement model. The results listed in Table 1 demonstrated that both values of Cronbach's Alpha coefficient and McDonald's Omega coefficient were greater than 0.70, which is the lowest limit for judging on measurement reliability (De Leeuw et al., 2019).

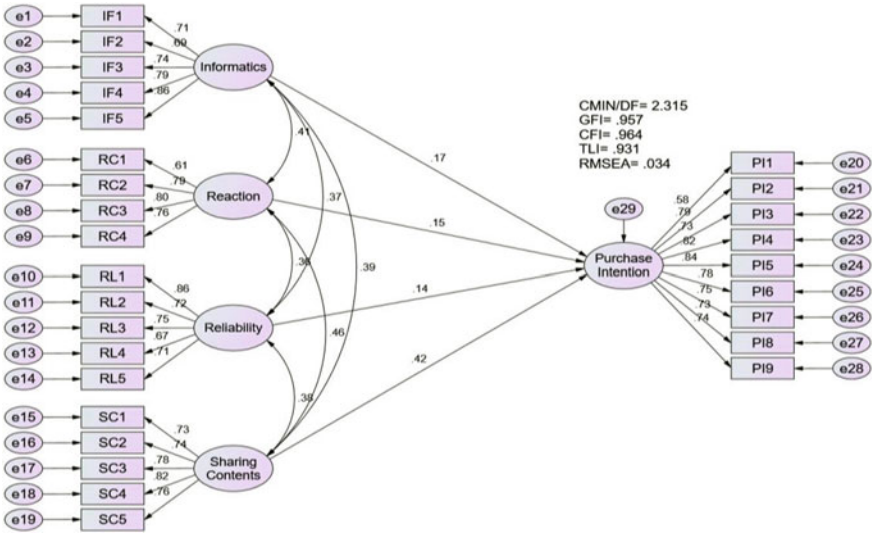

Fig. 2 SEM results of the social media effect on purchase intention

5.2 Structural Model

The structural model illustrated no multicollinearity issue among predictor constructs because variance inflation factor (VIF) values are below the threshold of 5, as shown in Table 1 (Hair et al., 2017). This result is supported by the values of model fit indices shown in Fig. 1 (Fig. 2).

The results in Fig. 1 indicated that the chi-square to degrees of freedom (CMIN/DF) was 2.315, which is less than 3 the upper limit of this indicator. The values of the goodness of fit index (GFI), the comparative fit index (CFI), and the Tucker-Lewis index (TLI) were upper than the minimum accepted threshold of 0.90. Moreover, the result of root mean square error of approximation (RMSEA) indicated to value 0.034, this value is a reasonable error of approximation because it is less than the higher limit of 0.08. Consequently, the structural model used in this study was recognized as a fit model for predicting the purchase intentionand generalization of its result (Ahmad et al., 2016; Shi et al., 2019). To verify the results of testing the study hypotheses, structural equation modeling (SEM) was used, the results of which are listed in Table 2.

The results demonstrated in Table 2 show that social media dimensions had a positive impact on purchase intention. Moreover, the results indicated that the highest impact was for Sharing Contents ($\beta = 0.423$, $t = 8.510$, $p = 0.000$), followed by informatics ($\beta = 0.172$, $t = 3.997$, $p = 0.002$), then reaction ($\beta = 0.152$, $t = 3.737$, $p = 0.007$), and finally the lowest impact was for reliability ($\beta = 0.136$, $t = 2.792$, $p = 0.000$).

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Table 2 Hypothesis testing

Hypothesis	Relation	Standard beta	*t* value	*p* value
H1	Informatics→Purchase intention	0.172	3.997**	0.002
H2	Reaction→Purchase intention	0.152	3.737**	0.007
H3	Reliability→Purchase intention	0.136	2.792**	0.000
H4	Sharing contents→Purchase intention	0.423	8.510***	0.000

Note $*p < 0.05$, $**p < 0.01$, $***p < 0.001$

6 Discussion

The results indicated that the respondents use social media to a high degree, as it is an important source for obtaining information, especially in this sector, and that the world is witnessing various transformations and rapid leaps towards the digital economy because of the easy access to service, in record time and with less effort, and that women have a desire to interact, and this means that social media is an effective means that encourages customers to interact in terms of expressing their comments about products, which provides service providers with information about products that are useful in improving and developing them in order to increase customer satisfaction and retention. Accordingly, after the interaction between customers and companies producing the Jordanian women's clothing sector, the two sides of the process can achieve their interests, at the customers level, it is possible to obtain good products according to their desires, and at the providers level of these products, they are able to improve the quality of products and achieve their goals in increasing their sales numbers, achieving profits and at the same time attracting new customers and maintaining old customers. Social media is a good source of information related to the Jordanian women's clothing sector, as advertisements through social media provide new, sufficient and adequate information about products and everything related to them in terms of new and modern, as well as giving an idea of prices to customers, meaning that customers can obtain information easily, and without effort and time.

Women have the ability and support to participate in the content, and this result means that social media provides the advantage of the customer sharing information about the brand with other users, regarding products in the Jordanian women's clothing sector, and this is a benefit and a cumulative advertising method known as the snowball; That is, the user shares information via social media with other users, and other users can share the same information with new users; Thus, the information reaches a wider number of users, which brings benefit to users in knowing new products, as well as benefits product providers to the women's clothing sector in advertising and marketing their products electronically without effort, and in record time. The respondents have the desire and intention to buy through social media because of the information these media provide about products. Through these media, it is possible to learn about the experiences and experiments of old customers who made the purchase through these media, and these media provide information about trusted and preferred brands, or other brands, which encourage customers to buy.

The results of the study concluded that there is a statistically significant effect of social media on purchasing intention in the women's clothing sector in Jordan. This result means that social media of all kinds provides an important advantage for the consumer, which is information about products, whether those related to prices, quality, quality, offers, etc., which encourages a change in consumers' tendency to purchase products in the women's clothing sector in Jordan. Reliable, honest and real information about the product attracts the person's attention and may consider sharing it with others and interacting with the producers to express opinions and observations that may be useful in improving, developing or updating the products, which benefits all parties to the purchasing process. This result is consistent with the finding of Al Saifi study (2018) which found that perceived interactivity, credibility, privacy, and advertiser reputation are among the influencing factors influencing consumer attitudes towards social network advertising. The result is also consistent with Alwan study (2018), which showed that social media provides features, including: interactive motivation, interactiveness and information, and it has a role in purchasing intentions. The result is also consistent with Al-Yassin study (2017), which showed a statistically significant effect of the dimensions of social networking sites through the electronic spoken word in the fashion sector. The result was also consistent with Al-Nesour et al. (2016), which showed an effect of marketing using social media on purchase intention. The result is consistent with Al-Kilani and Al-Qurashi (2015), which showed the existence of an impact of the social network on the consumer purchasing decision-making process in the city of Amman. The result coincides with Ismail, which found a significant effect of marketing through social media on brand loyalty and awareness. The result is consistent with Murtiningsihi & Murad (2016), which found that there is an effect of social media marketing on brand loyalty. The result met with the result of Tatar & Eren-Erdogmus (2016), which showed a positive impact of marketing through social media on trust and loyalty to the hotel brand.

7 Recommendations

Based on the previous results, the current study recommends organizations in the clothing sector to pay attention to social media and take advantage of it in advertising and marketing for the women's clothing sector in Jordan, due to the impact of these sites on the purchase intention of consumers, emphasizing the importance of clarifying all information for products, and the importance of interaction, credibility and content sharing, and to intensify the process of promoting their products through social media, in order to ensure that they reach the largest possible number of users of social networking sites. It also recommends adopting social media in its business and focusing its efforts in increasing the effectiveness of its content on social networks. And update, develop and improve their commercial advertisements in a convincing and effective way to provide customers with all that is new about

those products. Finally, the producers should update the information on these products so that customers can obtain this information easily and without effort and time to obtain it, and provide incentives and prizes to customers and users who share their promotional ads for their products with other users to reach the largest possible number of people.

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The Impact of the Digital Marketing for Education Services on the Mental Image for Students in Private Universities in Jordan

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Abstract This study aims to identifying the impact of digital marketing on the mental image of students at private universities in Jordan. The population of the study consisted of all the higher education students in the private Jordanian universities in (18) universities numbering (6381). The study sample was chosen randomly,

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_12

and it consisted of (359) male and female students. The distribution of the questionnaire was done through an electronic link by (Google Drive) and was sent to the students with the collaboration of the deanship of students' affairs. To conduct this study, the analytical and descriptive method was used. The results of the study showed a statistically significant effect of digital marketing on the mental image of students at private universities in Jordan. Based on the study results, the researchers recommend managers and decision makers of the private universities in Jordan to enhance their interactive advertisements on the pages of others, enhance the pricing of their educational services, and make updates on their marketing channels to achieve a positive image.

Keywords Digital marketing · Education services · Mental image · Private universities · Jordan

1 Introduction

The rapid developments in the business environment have led organizations to apply digital marketing to their products and services, and to shift from traditional marketing methods into digital methods (Al-Hawary & Al-Smeran, 2017; Al-Hawary & Hussien, 2017; Al-Hawary & Obiadat, 2021). The nature of the tasks carried out by the organization and the external surrounding factors should be taken into account. Hence, it has become necessary for modern organizations to take advantage of strategies, scientific methods and applied experiences in digital marketing in order to increase the number of their clients and enhance their confidence through studying modern trends for the development of digital marketing (Al-Hawary & Alhajri, 2020; Altarifi et al., 2015; AlTaweel & Al-Hawary, 2021). The development of information and communication technology since (1990) until now has led to many changes in organizations' use for information technology. A number of digital platforms have been gradually integrated into marketing plans, which has led to the significant spread of digital marketing, even though it was associated with customer relationship management applications (Al-Nady et al., 2016; Al-Hawary & Alwan, 2016; Al-Hawary & Al-Syasneh, 2020; Allahow et al., 2018; Al-Hawary & Ismael, 2010). Recently, it has developed in conjunction with the development of electronic applications, which made it easy to apply digital marketing strategies. Undoubtedly, it contributes to improve the effectiveness of the organization's marketing plans and achieving its future goals (Ahmad et al., 2021a, b, c; Alhalalmeh et al., 2020; Tariq et al., 2022a, b).

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Many organizations tended to take advantage of modern digital applications that provided them the opportunity to market their services through the information network (Ahmed et al., 2020; Almaazmi et al., 2020; Alwan & Alshurideh, 2022; Lee et al., 2022a, b). Private universities are among the most prominent organizations affected by the transition to the area of information, and aware to the importance of benefiting from modern technological concepts by using them in their business environment (Al Kurdi et al., 2020a; Alshurideh et al., 2019a, b; Alshurideh, 2022). Given that perspective, education is one of the most affected fields by the transition into the information area (Al-Hawary & Batayneh, 2010). Many universities in various countries of the world have tended to market their educational services through electronic applications, which include a virtual environment of electronic applications through which universities can market their educational services (Al-Hawary, 2010; Al Kurdi et al., 2020b; Alshurideh et al., 2020; Alshurideh et al., 2021a, b; Akour et al., 2021; Al-Hamad et al., 2021; Leo et al., 2021). In light of the intense competition between private universities towards marketing their educational services, using strategies that contribute to the formation of a mental image to their students, universities tend to achieve the competitive advantage through the formation of a positive mental image for the public (Al-Hawary & Al-Khazaleh, 2020; Alsharari & Alshurideh, 2020).

Accordingly, it has become important for universities to understand the needs of their students and society to understand the needs of their students and society to make them able to market their educational services according to modern and previously studied strategies, in order to form a perceptive mental image about the educational services provided by universities, which lead to affect their perception, motivation and desire to study in these universities, especially in light of the escalating competition between private universities to reach the competitive advantage. since the mental image of university students and the public reflects the mental representation that students can feel or hear about universities, the digital marketing of educational services, if it is built on modern marketing foundations and strategies, may have its effects on society's perception on the image of educational services provided by universities; this influence may raise the motivation and desires of individuals to study in private universities in Jordan.

The digital marketing of educational services is one of the issues related to modernity in the field of marketing technology; therefore it sheds light on the extent to which private universities in Jordan keep pace with modern managerial systems, models and strategies, as well as the extent to which private universities in Jordan use modern digital applications to contribute in dealing with all marketing relationship parties. In addition to clarifying the role played by digital marketing for educational services in shaping the mental image for its students and society as a whole. Accordingly, the results of this study emerged from a set of recommendations that help decision-makers in universities to reconsider their digital marketing strategies, which reflects a positive mental image for students in private universities in Jordan, and their prospective audience at the local and international levels. Here, this study came to reveal the impact of digital marketing for educational services on the mental image of students in private universities in Jordan.

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2 Theoretical Framework and Hypothesis Development

2.1 Digital Marketing

The concept of digital marketing has become concerning about the marketing of commercial services and products, but this concept has developed to be more comprehensive, as this digital transformation coincided with the development of universities. Great trends have emerged to use digital marketing tools in marketing educational services to universities by providing a set of scientific foundations and rules that contribute to keep pace with technological developments to bridge the gap between the requirements of marketing educational services and modern technology (Ahmed et al., 2017). Technological developments in the field of digital marketing have made it a marketing equivalent to regular marketing, with the addition of a new character, which is adapting to the requirements of modern marketing, and the tends of public. Digital marketing has become more advanced than conventional marketing because of its speed in transferring and downloading data easily and accurately. Moreover, digital marketing support interaction and communication between individuals and organizations implement marketing activities, contribute to adopt with modern developments as well (Al-Hawary & Obiadat, 2021).

Many universities have started to market their educational services by employing marketing activities and practices in a scientific manner, believing in the importance of marketing these services as one of the most important entrances to development and keeping pace with modernity. Digital marketing for educational services helps improve their competitive capabilities and raise the level of their marketing performance. From this point of view, digital marketing has become one of the scientific trends that universities have adopted through designing strategies and meaningful marketing plans to meet the needs of the public from these educational services (Muhammad, 2021).

Al Yamani indicated that digital marketing has many benefits, including: reducing costs by reducing the need for usual marketing uses such as printing and paper publishing, increasing marketing power by entering global markets, and contributing to increase competition in the provision of services or products. This leads to enable organizations to compete, improve communication between the public and the organization, and have control by following up individuals and knowing their tendencies.

Badous (2017: 442) indicated that the marketing of university educational services is: "analysis, planning, implementation, and control on university services they provide. It is a preparation that achieves the voluntary exchange of things that have value in the targeted markets to achieve the goals of the university based on the needs and desires of students, by using effective methods." for pricing, promotion, and distribution. On the other hand, Kotler explained that marketing educational services contributes to help students understand the wide changing context that is occurring at the university, by providing them with mechanisms through which they can extrapolate the future. Moreover, it provides them with important feedback as a

mechanism for determining the difference in specializations and building exchanges in needs and demand forms for university clients. Through this, the university knows about the quality of educational services that achieve student satisfaction over time.

Basha study (2019) indicated that it highlights the importance of digital marketing for educational services in the power of technological applications and marketing social media which contribute to share marketing information with a global audience; This marketing information for educational services, that is shared in the form of videos, photos or information, can have a significant role in influencing the decision-making process for students. It should be noted that marketing technology means, especially social websites, are followed-up by the majority of students. The adoption of popular marketing channels in marketing educational services contributes to reach the right audience, and also enhances the university's competitiveness and marketing performance. In order to let the university meet the needs of students, obtain a market share and achieve financial resources, it must have its own marketing mixture. Perhaps the most prominent digital marketing tools used by organizations are the following:

E-mail: E-mail is one of the digital media at which digital messages can be exchanged. Marketing through e-mail is called direct marketing, at which marketer sends his commercial messages to a group of people through digital messages, and these messages are newsletters sent by the organization to its clients to build a participatory relationship with them. Promotional messages can also be sent to the public that include specific advertisements and offers for services or products.

Social Media: Social media is one of the digital media that can be used as a type of digital marketing. These sites allow the organization to reach the largest number of clients by digital messaging and digital publishing that allows sharing commercial messages through these sites, whether these messages are written, audio, images or videos. These sites have contributed to transform the power of digital marketing from marketers to customers such as (Facebook, YouTube, Twitter, Instagram, WhatsApp) (AlHamad et al., 2021; Al-Maroof et al., 2021; Alshamsi et al., 2020). These sites are the most common, famous, used and least expensive in marketing, and it is used to promote and advertise digital marketing elements (Salloum et al., 2020).

Website: this is used by designing a digital page to be accessed by anyone through search engines on the Internet. Creating the organization's website requires images and information about the nature of the products or services it provides. The website plays an important role in marketing if the design is comprehensive, integrated, and attractive to users, and this contributes to supporting the online marketing process. The organization can show digital content on the site such as advertising, promotion, pricing, and the products or services it offers; in addition it can make it possible for the user to order directly (Al-Adili, 2015; Al-Hawary, 2013; Al-Hawary & Al-Menhaly, 2016; Al-Hawary & Harahsheh, 2014; Mohammad et al., 2020).

Smartphone Apps: Marketing applications available on mobile phones is an important tool of digital marketing, buying, and selling, where organizations can market their services or products through digital applications. Studies have proven that these applications have opened great horizons in the digital marketing process, as users

can download these applications on their mobile devices and see the most important products and services offered by organizations. These applications are characterized by giving the user the ability to try online shopping and follow up transactions easily (Al Dmour et al., 2014; Kurdi et al., 2021; Suleman et al., 2021).

2.2 Mental Image

The mental image became one of the important topics for researchers in the fields of media and management. Measuring and achieving it attracted the organizations by forming a mental image of the organization through planning and implementing its decisions, due to its importance in the social behavior on which the organizations are based. The formation of a positive mental image of the public is a goal that all organizations seek at all levels. The organization has always realized the importance of the emotional and mental connection between the organization and the public. The positive mental image of the public plays an important role in attracting dealers, gaining their satisfaction and loyalty to the organization. This contributes to increase its sales and enhance its reputation for the public opinion; thus, obtaining a competitive market portion for other organizations (Abu Qaaud et al., 2011; Al-Hawary et al., 2013, 2017; Alolayyan et al., 2018; Alshurideh et al., 2017; Metabis & Al-Hawary, 2013).

The definition of the mental image depends on the nature of the organizations' work, and the perspective from which this concept is seen. The concept of the mental image from the media point of view differs in some matters with the concept of the mental image from the point of view of management and marketing scholars. One of the most prominent definitions of the managerial mental image is: "impressions and values that are formed in the minds of others, from services and products provided by the organization to gain the client satisfaction" (Qaseem & Al-Aksha, 2020: 11). It is also defined as: the process of designing a set of mental differences through which the organization can distinguish its services and products from other competitors and their products in the similar market.

The researcher defines the mental image of educational services as: the impressions and perceptions of the public and university students about the level of quality of services and educational programs provided by a university, by realizing their importance, the extent of their impact on their motivation, and their desire to benefit from it if they have a positive mental image. The mental image has many dimensions at which the level of this image is measured for individuals; these dimensions are: **Perception** is the individual's reception of information related to the things surrounding him, and the ability of the individual to sort and organize the information he receives. In order to reach the perception, there should be a coherent and effective image that makes the individual see things in the same way seen by others (Al-Shammari, 2017). **Influence** refers to the result of the interaction conducted by the individual and the organization, which is summarized in the extent to which the organization convinces individuals with its services or products, through its moral

commitment towards them, as well as their efforts to achieve success which makes individuals ready to deal with them. **Motivation** refers to the internal self-power that encourages the individuals to deal with the organization, as a result of the organization's fulfillment of their desires and needs, through their feelings, emotions, behavior and motives towards it (Gallab, 2011). **Desire** refers to the extent to which the organization satisfy and meet the needs and desires of individuals, according to their future aspirations and ambitions as a result of dealing with an organization. Regarding university students, the desire is fulfilled when they find that universities make them special and responsible people to achieve success, as well as respecting them by the society (Al-Amri, 2015).

2.3 The Relationship Between Digital Marketing and Mental Image

Abu Naser and El Talla, explained the reality of the effectiveness of electronic marketing in technical colleges in Palestine; he found that there is a correlation between smart dimensions and sustainability. While Nizar and Janathanan sees that customers of online stores can choose the suitable product through social networking sites, and this kind of shopping is safe and effective, as well as digital marketing through social media affects the buying behavior of the consumer. Aljawarneh et al. showed that the e-marketing elements represented in the dimensions of (nature of banking service, pricing of banking services, and promotion of banking services) have a positive impact on forming the mental image of customers.

Oluwasola, indicated that private universities mostly use digital marketing tools such as university website, social media marketing and digital marketing. Nurbait et al., explained that there are differences in digital marketing applied in universities listed in the TopTwenty category) with unlisted universities, at which listed universities implemented digital marketing in (8) types, namely (Search engine optimization, content marketing, influencing marketing, marketing automation, and social media marketing) which made listed universities gain a consuming community of unlisted universities during the COVID-19 pandemic. Thus, the hypothesis of the study can be formulated as follows:

There is a statistically significant effect at the significance level ($\alpha > 0.05$) of digital marketing for educational services on the mental image of private university students in Jordan.

3 Study model

See Fig. 1.

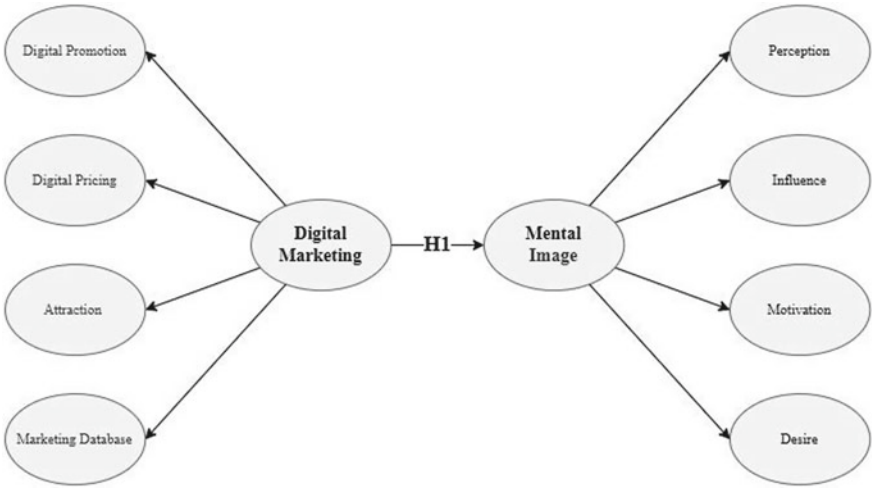

Fig. 1 Research model

4 Methodology

4.1 Population and Sample Selection

A qualitative method based on a questionnaire was used in this study for data collection and sample selection. The major aim of the study was to examine the impact of digital marketing on a mental image. Therefore, it was focused on private universities in Jordan. Data were primarily gathered through self-reported questionnaires created by Google Forms which were distributed to a random sample of (430) postgraduate students. In total, (359) responses were received including (13) invalid to statistical analysis due to uncompleted or inaccurate. Hence, the final sample contained (346) responses suitable to analysis requirements that were formed a response rate of (80.46%), where it proved to be sufficient to the extent that was predictable and allowed for a presumption of data saturation (Sekaran & Bougie, 2016).

4.2 Measurement Instrument

A self-reported questionnaire that consists of two main sections along with a section regarding control variables was used as the measurement instrument. Control variables considered as categorical measures were composed of gender, age group, educational level, and experience. The two main sections were dealt with a five-point Likert scale (from 1 = strongly disagree to 5 = strongly agree). The first section contained (23) items to measure digital marketing based on (Kusumawati, 2019; Warokka,

2020). These questions were distributed into dimensions as follows: six items dedicated for measuring digital promotion, five items dedicated for measuring digital pricing, five items dedicated for measuring attraction, and seven items dedicated for measuring marketing database. Whereas the second section included (21) items developed to measure mental image according to what was pointed by (Larson et al., 2009). This variable was divided into four dimensions: perception that was measured through five items, influence which measured by six items, motivation was measured using five items, and desire that were measured by five items.

5 Findings

5.1 Measurement Model Evaluation

This study was conducted structural equation modeling (SEM) to test hypotheses, which represents a contemporary statistical technique for testing and estimating the relationship between factors and variables (Wang & Rhemtulla, 2021). Accordingly, the reliability and validity of the constructs were tested using confirmatory factor analysis (CFA) through the statistical program AMOSv24. Table 1 summarizes the results of convergent and discriminant validity, as well the indicators of reliability.

Table 1 shows that the standard loading values for the individual items were within the domain (0.641–0.894), these values greater than the minimum retention of the elements based on their standard loads (Al-Lozi et al., 2018; Sung et al., 2019). Average variance extracted (AVE) is a summary indicator of the convergent validity of constructs that must be above 0.50 (Howard, 2018). The results indicate that the AVE values were greater than 0.50 for all constructs, thus the used measurement model has an appropriate convergent validity. Rimkeviciene et al. (2017) suggested the comparison approach as a way to deal with discriminant validity assessment in covariance-based SEM. This approaches based on comparing the values of maximum shared variance (MSV) with the values of AVE, as well as comparing the values of square root of AVE ($\sqrt{}$AVE) with the correlation between the rest of the structures. The results show that the values of MSV were smaller than the values of AVE, and that the values of $\sqrt{}$AVE were higher than the correlation values among the rest of the constructs. Therefore, the measurement model used is characterized by discriminative validity. The internal consistency measured through Cronbach's Alpha coefficient (α) and compound reliability by McDonald's Omega coefficient (ω) was conducted as indicators to evaluate measurement model. The results listed in Table 1 demonstrated that both values of Cronbach's Alpha coefficient and McDonald's Omega coefficient were greater than 0.70, which is the lowest limit for judging on measurement reliability (De Leeuw et al., 2019).

Table 1 Results of validity and reliability tests

Constructs	1	2	3	4	5	6	7	8
1. DPRO	**0.778**							
2. DPRI	0.517	**0.796**						
3. ATTR	0.497	0.538	**0.793**					
4. MADB	0.435	0.511	0.492	**0.780**				
5. PERC	0.409	0.446	0.537	0.563	**0.789**			
6. INFL	0.628	0.638	0.624	0.597	0.628	**0.785**		
7. MOTI	0.579	0.599	0.662	0.681	0.571	0.601	**0.754**	
8. DESI	0.638	0.658	0.674	0.671	0.552	0.668	0.647	**0.797**
VIF	3.008	3.466	3.189	3.415	–	–	–	–
Loadings range	0.684–0.883	0.692–0.874	0.704–0.891	0.657–0.894	0.691–0.884	0.641–0.877	0.704–0.855	0.695–0.864
AVE	0.605	0.633	0.628	0.609	0.623	0.615	0.569	0.635
MSV	0.503	0.497	0.516	0.467	0.514	0.503	0.497	0.506
Internal consistency	0.897	0.893	0.892	0.911	0.889	0.903	0.866	0.894
Composite reliability	0.901	0.895	0.894	0.915	0.891	0.905	0.868	0.896

Note DPRO: digital promotion, DPRI: digital pricing, ATTR: attraction, MADB: marketing database, PERC: perception, INFL: influence, MOTI: motivation, DESI: desire, bold fonts in the table indicate to root square of AVE

5.2 Structural Model

The structural model illustrated no multicollinearity issue among predictor constructs because variance inflation factor (VIF) values are below the threshold of 5, as shown in Table 1 (Hair et al., 2017). This result is supported by the values of model fit indices shown in Fig. 1 (Fig. 2).

The results in Fig. 1 indicated that the chi-square to degrees of freedom (CMIN/DF) was 2.064, which is less than 3 the upper limit of this indicator. The values of the goodness of fit index (GFI), the comparative fit index (CFI), and the Tucker-Lewis index (TLI) were upper than the minimum accepted threshold of 0.90. Moreover, the result of root mean square error of approximation (RMSEA) indicated to value 0.049, this value is a reasonable error of approximation because it is less than the higher limit of 0.08. Consequently, the structural model used in this study was recognized as a fit model for predicting the DEP and generalization of its result (Ahmad et al., 2016; Shi et al., 2019). To verify the results of testing the study hypotheses, structural equation modeling (SEM) was used, the results of which are listed in Table 2.

The results demonstrated in Table 2 show that digital marketing had a positive impact relationship on the mental image. Moreover, the results indicated that the highest impact was for marketing database ($\beta = 0.464$, $t = 29.905$, $p = 0.000$), followed by digital pricing ($\beta = 0.245$, $t = 19.241$, $p = 0.000$), then attraction ($\beta = 0.153$, $t = 18.273$, $p = 0.032$), and finally the lowest impact was for digital promotion ($\beta = 0.122$, $t = 13.522$, $p = 0.040$).

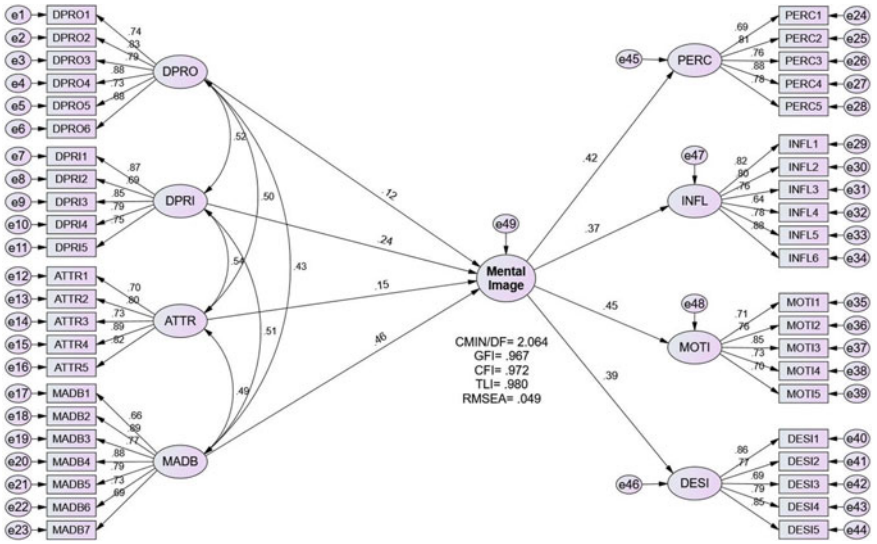

Fig. 2 SEM results of the digital marketing effect on mental image

Table 2 Hypothesis testing

Relation	Unstandardized coefficient (B)	Standardized error (S.E.)	Standardized coefficient (β)	*t* value	*p* value
Digital promotion → Mental image	0.311	0.023	0.122	13.522	0.040
Digital pricing → Mental image	0.558	0.029	0.245	19.241	0.000
Attraction → Mental image	0.402	0.022	0.153	18.273	0.032
Marketing database → Mental image	0.628	0.021	0.464	29.905	0.000

Note * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

6 Discussion

The study results showed that private universities keep pace with technological developments in the field of digital marketing for educational services, and this indicates the presence of strengths in most cases, and there are some matters that should be improved in order to promote digital marketing of educational services in these universities. The results indicate that private universities in Jordan often make prices of educational services available to their students and public through their approved digital marketing channels. Thus, it appears that some universities still avoid showing prices for services through their digital channels. The results also confirmed that private universities use digital content that attracts the majority of students to benefit from digital marketing for educational services, but the content is not highly attractive, which shows the presence of some complications and low clarity of the information provided by some private universities in Jordan.

Moreover, the results showed that private universities in Jordan often take advantage of modern technology to open digital marketing channels from digital websites, smart phone applications and social networking sites to be able to communicate with their audience. It also indicates that the ability of marketing databases is acceptable to some extent, and that the majority of Jordanian private university students realize the importance of the educational services provided by the university to them, through the information published by the university to consolidate its relationship with its students; thus, private universities in Jordan raise students' awareness by meeting their educational needs. Through the influential impressions of the university as a result of providing educational services, the results showed an impact of digital marketing for educational services on the mental image of students of private universities in Jordan, and that digital marketing is one of the important factors in forming the mental image of students. This was supported by Stefco et al., whose

results showed the existence of a correlation and impact of electronic marketing tools on the image of the university.

It can be concluded that whenever private universities in Jordan increase their interest in marketing educational services, this will reflect positively on the mental image of students, which will lead to transfer the mental image to the public. This also makes students partners of the university in marketing educational services. The results indicate a positive impact of digital promotion on the mental image of graduate students, but this effect is small, due to the presence of weakness in the planning of marketing strategies at private universities, as private universities were not successful in choosing methods and promotional strategies that enhance their mental image among students.

In addition, the results showed that the digital content in universities does not meet the aspirations to some extent, and this may be due to the digital marketing channels of the universities that still need to be updated and developed in a way that makes their characteristics, advantages and design in line with the aspirations of students.

7 Recommendations

Based on the study results, it recommends the university administrations to enhance interactive advertisements on other pages, funded digital advertisements through social networking sites to contribute to attracting targeted students should be at the internal and external levels to benefit from their enrollment in the study programs they offer, as well as promote the pricing of its educational services, by setting attractive price offers for students, which works to achieve the comparative advantage of universities through price differentiation strategies.

The study also recommends universities to develop their marketing channels, especially their official websites, to be in line with the current developments and within modern designs that are attractive to students. Moreover, they need to conduct periodic surveys to reveal the strengths and weaknesses in their digital marketing strategies for educational services, to find a kind of continuous improvement on their digital marketing.

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Impact of Social Media Marketing on Creating Brand Responsiveness

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Abstract The aim of the study to examine the Impact of social media marketing on creating brand responsiveness. It focused on public universities in Jordan. Data were primarily gathered through self-reported questionnaires creating by Google Forms which were distributed to a sample (785) student via email. In total, (564) responses were received including (38) invalid to statistical analysis due to uncompleted or inaccurate. Hence, the final sample contained (526) responses suitable to analysis requirements. Structural equation modeling (SEM) was conducted to test hypotheses. The results showed that social media marketing dimensions had impact on creating the response to the brand. However, the results indicated that the highest impact was for e-word of mouth. Based on the results of the study, the researchers recommend

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_13

educating young people about the concepts associated with the use of marketing social media from breach of privacy and addiction to its use.

Keywords Social media marketing · Brand responsiveness · Public Universities · Jordan

1 Introduction

Social media is primarily a source of communication, information, entertainment, and for commercial transactions; As one of its main uses is marketing, communication, and branding through social sites (such as Facebook, Twitter) in addition to communicating with customers to know their response and making the necessary improvements to offered products (Al-Hawary & Hussien, 2017; Al-Hawary & Mohammad, 2011; Al-Maroof et al., 2021a, b). Social media is primarily a source of communication, information, entertainment and a medium social media is one of the effective marketing tools that is concerned with applying knowledge and techniques to enhance economic and social exchanges, and satisfy users' needs and desires based on the marketing products and services implications analysis, and maintaining relationships with users and making friends and social interaction (Al-Hawary & Al-Fassed, 2022; Al-Hawary & Alhajri, 2020; Al-Qudah et al., 2012; Altarifi, 2015; Khasawneh et al., 2021a, b).

Study importance highlights social media marketing role in marketing, interaction and information exchange between customers, which helps companies and brand owners in promoting their products and reaching all customers in a faster and less costly way than traditional (Al-Hawary & Al-Khazaleh, 2020; Alshurideh et al., 2019). The data published on the Social Packers website, which specializes in social networking statistics, stated that Jordan ranked seventh in the list of Arab countries that use the social networking site Facebook, with an average of one million subscribers, and ranked 60th globally out of 213 countries surveyed. Social media importance increasing its popularity among Arab youth, as a social media report issued by the Mohammed bin Rashid School of Government shows that the number of Facebook users in 22 Arab countries, including Jordan, reached 81.3 million in May 2014, 67% of whom are under 30 As for Twitter, the number of users reached 57 million, generating 17.2 million tweets per day, while the average use of LinkedIn was 8.4 million, of whom 68% were between the ages of 18–35 years (Abdel-Fattah, 2016). Brand awareness and identity can be built through social media, people-to-people communication and interaction, and information free exchange; especially the youth group, as they are the group that uses social media the most (Aljumah et al., 2021; Kurdi et al., 2021). Social media spread such as Facebook and Twitter via the Internet among a large segment of people, especially the youth group, has forced many organizations to resort to these means as promotional and marketing tools for their products and an important way to raise the brand reputation level, because the user of social media via the Internet interacts with emerged information

and brands a way that is expected to have a greater impact than traditional media (Almazrouei et al., 2020; Alwan & Alshurideh, 2022). Hence, this study comes to show the impact that social media had on the youth category (a sample of Jordanian public university students) in building a brand.

2 Literature Review and Hypotheses Development

2.1 Social Media Marketing

The term social media derives from two words: media, which refers to advertising and communication, which includes ideas and information through marketing social media, and the word social: means individuals interaction within a group (Al-Hawary & Abu-Laimon, 2013; Al-Hawary & Metabis, 2012; Alshurideh, 2022). These media refer to the information democratization and the transformation of users from content readers to content publishers, and take several forms, such as: Internet forums, messages, blogs, commercial images and videos (Al-Hawary & Ismael, 2010; Allahow et al., 2018; Neti, 2011; Lee et al., 2022a, b). Social media is defined as a group of Internet-based applications built on ideological and technological foundations from the Web (2.0) that allow the creation and exchange of user-generated content), the exchange of content and the ability to interact with other users and brand supporters; makes it an ideal management in marketing and consumer engagement in the media as a tool for enabling decision-making and obtaining reliable information (Al-Hawary & Batayneh, 2010; Koshy, 2013; Tariq et al., 2022a, b). Baruah (2012) defined it as the media for social interaction as a comprehensive that goes beyond marketing social communication and includes several types, namely: collaborative projects (Wikidia), blogs, micro-blogs (Twitter), content communities (YouTube), and networking sites such as (FB). The researchers assure that media marketing contributes to convincing consumers that the company's products and services are worthwhile, through the online communities use and knowledge, concepts and techniques necessary application to advance economic and social ends, and is concerned with analyzing marketing policies implications, activities and decisions. It is a strategic and systematic process to establish the company's influence and enhance the brand's reputation (Abu Zayyad et al., 2021; Al-Hawary & Harahsheh, 2014; Neti, 2011). Social media provides two-way communication, as there is no marketing tool that provides effective two-way communication, through which reactions can be known, customer service and care can be provided to obtain real business results. It contributes to building trust and credibility (Al-Hawary & Al-Menhaly, 2016; Al-Hawary & Al-Namlan, 2018; Almaazmi et al., 2020; Divya & Bulomine, 2014). One of the most important dimensions of social media is the **information quality**: information quality refers to the information content that can attract the user to visit the site again on a regular basis for e-commerce, information and media content quality on the Facebook page and their response to customers' needs, and

also refers to the information quality about products and services, and the quality of system outputs to make sound decisions in the purchasing process, as the high quality of information increases the chance of maintaining customers to return to the site by providing accurate, detailed and timely information (Ahmed et al., 2020; ; Thumsamisorn & Rittippant, 2011). **Electronic service quality**: electronic service quality is defined as the customer's experience with the service provider, through a specific electronic channel, without human intervention, as social media is the main channel for providing electronic services (Abbad & Al-Hawary, 2011; Abu Qaaud et al., 2011; Al-Hawary et al., 2012; Alshurideh, 2019; Alshurideh et al., 2021; Metabis & Al-Hawary, 2013). **Social Interaction**: the interaction with the brand that these media provide is based on the message and perceived risk of the buying process, prompting the user to think more about product quality and usefulness (Al-Hawary et al., 2011; Alolayyan et al., 2018; Alshurideh et al., 2017; Loanas & Stoica, 2014). **Social impact:** Social networking sites are seen as a means of advertising, which every brand must adopt, as social media marketing—as a means of promotion—contributes to a positive relationship between the brand and the audience in the Internet environment for social impact and maintaining stronger attitudes towards the brand and use of social media and platforms around the industry, competitors, products and companies that increasingly reach customers through social networks (Abuhashesh et al., 2021; Baruah, 2012). **Friendship Dimension:** Social media is effective for connecting with friends, family, and entertainment. These media allow individuals to generate content, engage in conversations, collaborate, participate, and help (Hasan et al., 2022; Parsons & College, 2011). **Social Engagement:** Sharing a long-term relationship with customers is essential for businesses and is used by many marketers to form the bond between the company and customers. Knowing the customers reaction to a particular product or brand, as obtaining the best customer participation is useful for companies in encouraging customers to make decisions (Barhemmati & Ahmed, 2015; Al-Dmour et al., 2021). **Entertainment**: refers to the advertising media ability to meet consumer needs to enjoy them, and studies have shown that entertainment advertising can meet the needs of the audience for entertainment, and that it has a positive impact on the attitude of consumers towards advertising and communication with the brand. **Wom** is also defined as the consumer's participation in the brand related to the electronic word through marketing social media, and this participation is positive or negative by potential, actual or former customers about the product or company that is available through Internet companies and websites Electronic Communication (Al-Maroof et al., 2021a, b; Thurau et al., 2004).

2.2 Brand Responsiveness

The way to build a distinctive brand is the ability to choose a name, logo, symbol, packaging design, and other attributes that define the product and distinguish it (Keller, 2013; Al-Hawary, 2013). A brand is defined as a set of assets and liabilities

associated with the brand, its name and symbol, that add or subtract from the value it provides to the company's product or service (Al-Hawary et al., 2013a, b; George et al., 2015; Kayaman & Arasli, 2008). Marketing tools directed towards social media marketing are increasing steadily, which indicates the interest of marketers in establishing the brand through social media marketing and interaction with users, which helps in shaping their experiences and benefiting from their opinions.

We can build a brand by creating a mark in memory, creating a brand image and increasing sales (Al-Hawary & Al-Smeran, 2017; Al-Hawary & Obiadat, 2021). Marketing communications include advertising and sales promotion, direct marketing, personal selling, word of mouth, and interactive marketing that includes activities and programs aimed at engaging customers on the Internet and raising awareness. In the context of social media marketing, companies can keep consumers close to the brand and its name, by taking advantage of the positive and direct communication provided by the marketing social media, the activities that they offer and giving them discounts and promotions, or using the contact page as a channel to direct sales, increase sales by spreading positive word of mouth, this gives an opportunity to interact with customers, and influence others in social networks through the experiences of others with the brand, so that it contributes to supporting if the experience is positive. Positive emotional connections with the brand help users become advocates of the brand. Companies must encourage commencers to like the brand, and they must add content that adds value to the brand's page users (Tsimonis & Dimitriadis, 2014). Creating the response towards the brand is through knowing the appropriate customers response towards the brand, and it is known through the customers' judgments towards the brand and their feelings towards it, and the following is an explanation for each of them: Brand judgments: Brand judgments: are customers' personal opinions of the brand and brand performance evaluation. Judgments can be about quality, credibility, and superiority. Brand position and brand quality are the brand overall divisions. Brand position depends on specific brand attributes; it includes the brand's credibility, brand characteristics (innovative or pioneering), the entertainment availability, brand pleasure, as well as the brand superiority to build an active relationship with customers (Hamadneh et al., 2021; Sweiss et al., 2021). As for the brand's feelings, it represents the brand emotional reaction, and how the brand affects the feelings of customers and their relationship with others, these feelings can be positive or negative, They include: warmth feelings, fun (optimistic), excitement, and security: comfort, confidence, social situations (looking at them positively and acknowledging them), Self-esteem: a sense of pride, accomplishment, and fulfillment (Keller, 2013). The brand is a long-term commitment to live up with brand promise made, focus on consistency, clarity, and convergence to build brand content, and manage the brand by delivering on promises and cultivating brand trust.

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2.3 Social Media and Brand Responsiveness

Social networks dimensions have an impact on the purchasing decision (Adaileh, 2015), and social networks play an important role in marketing and in managing the customer relationship due to the characteristics of these means of communication, social interaction and dialogue between companies and the customer without spatial and temporal restrictions (Noureddine, 2014). Al-Khatib (2014) added that there is an impact of the electronically transmitted word dimensions on electronically spoken word confidence, and the impact of confidence in the electronically transmitted word on the trend towards hotel service, and there is an effect of electronically spoken word confidence in making the purchasing decision. Customer engagement via social media leads to an emotional connection between customers and the brand according to Barhemmati & Ahmed (2015). Customers have positive attitudes toward companies and brands that use social media platforms, and customer engagement via social media leads to an emotional connection between customers and the brand, and to promote customer loyalty to the company, and customer communications via social media led to generating favorable word of mouth towards the brand, where positive word of mouth via social media influences consumer purchasing behavior. Ramnarain and Govender (2013) emphasized that companies with social media activities have a long-lasting and strong brand because of their nurturing and concern for customers, and that credibility has a positive impact on the brand because providing information on networks to help customers know their responses and share content has favorable brand impact, as well as the positive brand impact of quick customer access. Consumers in Pakistan are interested in using social media platforms, blogs, Twitter, and YouTube, and prefer social networking sites Facebook and Google, according to Bilal et al. (2014), because these means provide reliable information about brands, products, and services, as well as the impact of the word transmitted electronically on decisions. Consumers buy about the brand through comments and shares provided by social networks, which contribute to the impact of the word transmitted electronically on decisions. Kim and Ko (2010) show that entertainment has a positive and significant impact on the relationship with customers, that entertainment, personalization and direction positively affect the relationship with customers, and that the luxury industry aims to provide added value to customers, and it remains for the brand to focus on providing Free services, customized services, and additional services, which contribute to strengthening relationships with customers. It also indicated that by using social media marketing; It can retain old customers, attract new ones, and encourage competition among luxury fashion brands. The results also found that the dimensions of entertainment, personalization, and trend positively affect customer relationship, brand loyalty, and frequency of purchase. Accordingly, the study hypothesis can be formulated as follows:

There is a statistically significant effect of the use of social media marketing in creating brand responsiveness.

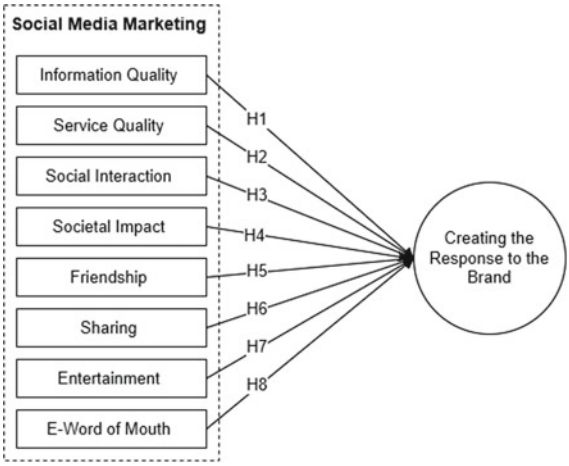

Fig. 1 Research model

3 Study Model

See Fig. 1.

4 Methodology

4.1 Population and Sample Selection

A qualitative method based on a questionnaire was used in this study for data collection and sample selection. The major aim of the study was to examine the impact of social media marketing on creating the response to the brand. Therefore, it focused on public universities in Jordan. Data were primarily gathered through self-reported questionnaires creating by Google Forms which were distributed to a sample (785) students via email. In total, (564) responses were received including (38) invalid to statistical analysis due to uncompleted or inaccurate. Hence, the final sample contained (526) responses suitable to analysis requirements that were formed a response rate of (67%), where it proved to be sufficient to the extent that was predictable and allowed for a presumption of data saturation (Sekaran & Bougie, 2016).

4.2 Measurement Instrument

A self-reported questionnaire that consists of two main sections along with a section regarding control variables was used as the measurement instrument. Control variables considered as categorical measures were composed of gender, age group, educational level, and experience. The two main sections were dealt with a five-point Likert scale (from 1 = strongly disagree to 5 = strongly agree). The first section contained (40) items to measure social media marketing based on (Loanas & Stoica, 2014). These questions were distributed into dimensions as follows: five items dedicated for measuring information quality, five items dedicated for measuring service quality, five items dedicated for measuring social interaction, five items dedicated for measuring societal impact, five items dedicated for measuring friendship, five items dedicated for measuring sharing, five items dedicated for measuring entertainment, and five items dedicated for measuring e-word of mouth. Whereas the second section included five items developed to measure creating the response to the brand according to what was pointed by (Barhemmati & Ahmed, 2015).

5 Findings

5.1 Measurement Model Evaluation

This study was conducted structural equation modeling (SEM) to test hypotheses, which represents a contemporary statistical technique for testing and estimating the relationship between factors and variables (Wang & Rhemtulla, 2021). Accordingly, the reliability and validity of the constructs were tested using confirmatory factor analysis (CFA) through the statistical program AMOSv24. Table 1 summarizes the results of convergent and discriminant validity, as well the indicators of reliability.

Table 1 shows that the standard loading values for the individual items were within the domain (0.641–0.903), these values greater than the minimum retention of the elements based on their standard loads (Al-Lozi et al., 2018; Sung et al., 2019). Average variance extracted (AVE) is a summary indicator of the convergent validity of constructs that must be above 0.50 (Howard, 2018). The results indicate that the AVE values were greater than 0.50 for all constructs, thus the used measurement model has an appropriate convergent validity. Rimkeviciene et al. (2017) suggested the comparison approach as a way to deal with discriminant validity assessment in covariance-based SEM. This approach is based on comparing the values of maximum shared variance (MSV) with the values of AVE, as well as comparing the values of square root of AVE ($\sqrt{}$AVE) with the correlation between the rest of the structures. The results show that the values of MSV were smaller than the values of AVE, and that the values of $\sqrt{}$AVE were higher than the correlation values among the rest of the constructs. Therefore, the measurement model used is characterized by discriminative validity. The internal consistency measured through Cronbach's Alpha

Table 1 Results of validity and reliability tests

Constructs	1	2	3	4	5	6	7	8	9
1. INQ	**0.751**								
2. SEQ	0.264	**0.781**							
3. SIN	0.337	0.258	**0.766**						
4. SIM	0.274	0.325	0.311	**0.727**					
5. FRS	0.294	0.354	0.346	0.364	**0.760**				
6. SHA	0.351	0.395	0.285	0.332	0.285	**0.767**			
7. ENT	0.341	0.226	0.297	0.316	0.384	0.221	**0.742**		
8. EWM	0.335	0.274	0.349	0.357	0.264	0.325	0.332	**0.778**	
9. CRB	0.415	0.428	0.485	0.439	0.406	0.459	0.394	0.408	**0.789**
VIF	1.251	1.034	2.415	1.335	1.371	1.954	1.285	1.574	–
L.R	0.684–0.835	0.562–0.903	0.641–0.871	0.682–0.764	0.725–0.801	0.719–0.835	0.722–0.764	0.729–0.864	0.715–0.848
AVE	0.565	0.610	0.587	0.528	0.577	0.588	0.551	0.605	0.622
MSV	0.351	0.441	0.385	0.497	0.451	0.462	0.495	0.482	0.473
I.C	0.864	0.882	0.873	0.846	0.870	0.875	0.857	0.881	0.890
C.R	0.866	0.885	0.875	0.848	0.872	0.877	0.860	0.884	0.891

Note INQ: information quality, SEQ: service quality, SIN: social interaction, SIM: societal impact, FRS: friendship, SHA: sharing, ENT: entertainment, EWM: e-word of mouth, CRB: creating the response to the brand, L.R: loadings range, I.C: internal consistency, C.R: composite reliability

coefficient (α) and compound reliability by McDonald's Omega coefficient (ω) was conducted as indicators to evaluate measurement model. The results listed in Table 1 demonstrated that both values of Cronbach's Alpha coefficient and McDonald's Omega coefficient were greater than 0.70, which is the lowest limit for judging on measurement reliability (De Leeuw et al., 2019).

5.2 Structural Model

The structural model illustrated no multicollinearity issue among predictor constructs because variance inflation factor (VIF) values are below the threshold of 5, as shown in Table 1 (Hair et al., 2017). This result is supported by the values of model fit indices shown in Fig. 1 (Fig. 2)

The results in Fig. 1 indicated that the chi-square to degrees of freedom (CMIN/DF) was 2.617, which is less than 3 the upper limit of this indicator. The values of the goodness of fit index (GFI), the comparative fit index (CFI), and the Tucker-Lewis index (TLI) were upper than the minimum accepted threshold of 0.90. Moreover, the result of root mean square error of approximation (RMSEA) indicated to value 0.061, this value is a reasonable error of approximation because it is less than the higher limit of 0.08. Consequently, the structural model used in this study was recognized as a fit model for predicting the creating the response to the brand and generalization of its result (Ahmad et al., 2016; Shi et al., 2019). To verify the results of testing the study hypotheses, structural equation modeling (SEM) was used, the results of which are listed in Table 2.

The results demonstrated in Table 2 show that most of social media marketing dimensions had no impact on creating the response to the brand. However, the results indicated that the highest impact was for e-word of mouth ($\beta = 0.411$, $t = 9.866$, $p = 0.000$), followed by sharing ($\beta = 0.388$, $t = 6.678$, $p = 0.000$), and finally the lowest impact was for societal impact ($\beta = 0.294$, $t = 4.400$, $p = 0.000$).

6 Discussion

The results of the study showed that social media enables consumers to exchange information with their peers about the brand and allows them to exchange conversations. Consumers prefer social media marketing sites to keep up with brand products and promotional campaigns, and their desire to see updated content about the brand, the popularity of content among friends increases brand loyalty, and the effect of electronically transmitted word positively on brand loyalty and this is consistent with. This emphasizes the possibility of building brand commitment and loyalty through social media marketing that helps improve brand visibility away from barriers that prevent information flow, in addition to the ease of use of the Internet by marketers to communicate with consumers and the target audience. The results of the study showed

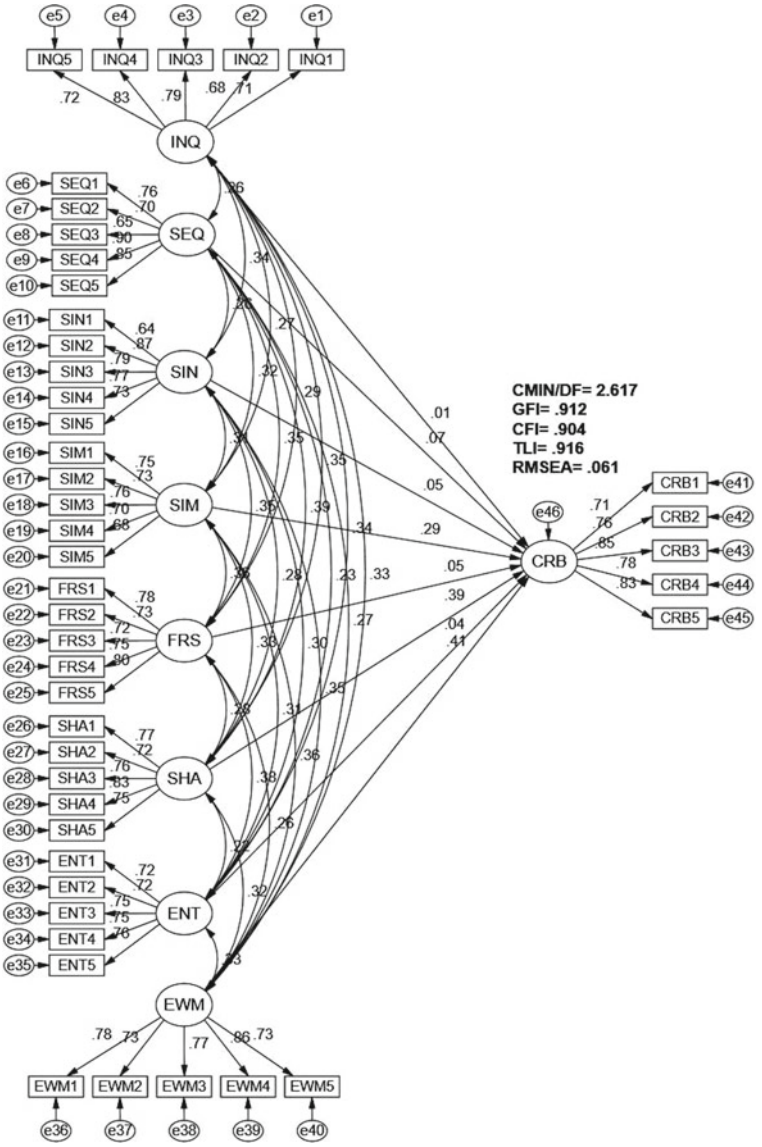

Fig. 2 SEM results of the social media marketing effect on creating the response to the brand

that there is a statistically significant effect towards the use of marketing social media in creating brand responsiveness. We conclude from this that the marketing social media is an ideal and positive environment for promoting social marketing communication and an ideal and positive environment to enhance social interaction and dissemination of knowledge and information and communication with friends in

Table 2 Hypothesis testing

Hypothesis	Relation	Standard Beta	*t* value	*p* value
H1	Information quality→Creating the response to the brand	0.011	0.0274	0.785
H2	Service quality→Creating the response to the brand	0.077	1.444	0.149
H3	Social interaction→Creating the response to the brand	0.053	1.079	0.281
H4	Societal impact→Creating the response to the brand	0.294***	4.400	0.000
H5	Friendship→Creating the response to the brand	0.046	0.867	0.386
H6	Sharing→ Creating the response to the brand	0.388***	6.678	0.000
H7	Entertainment→Creating the response to the brand	0.040	0.805	0.421
H8	E-Word of mouth→Creating the response to the brand	0.411***	9.866	0.000

Note $*p < 0.05$, $**p < 0.01$, $***p < 0.001$

addition to To know these means for the needs of the study community and work to meet them and prepare to help them and provide urgent service, in addition to being friendly and courteous in dealing with users, which motivates them to exchange opinions, conversations and recommendations based on past experiences. This is consistent with a study by Loanas and Stocica (2014) that found that users turn to social networks to maintain friend relationships and contact with them.

7 Recommendations

Based on the results of the study, the researchers recommend educating young people about the concepts associated with the use of marketing social media from breach of privacy and addiction to its use. It is also useful for brand owners to not limit their interest in identifying the best sites to target, and this is the classic method of planning or buying advertising spaces in advertising media; But it extends to knowing the reasons why users join those groups, campaigning and recommending messages to create groups that consumers want to join, so that its informational message covers more consumers more effectively. Modern marketing social media has transformed from a textual media tool to a comprehensive audio-visual media tool, which indicates the need for those in charge of managing social media marketing communications and marketers to know how students use marketing social networks and their impact on them, to enhance the share of companies in competitive markets Develop brand loyalty and enhance its reputation.

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Evaluation of the Digital Divide Status and Its Impact on the Use of TikTok Platform Through E-Commerce Activities

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Abstract The current paper was looking at how the factors of content richness, trust, perceived ease of use, perceived usefulness and user satisfaction impact TikTok acceptance. Participants of this study were 145 Telecenter users from three regions in Jordan. Their use of TikTok platform in e-commerce activities was examined. The data from the survey were analyzed and the obtained results led to the discussion on the policy implications in guiding both government agencies and customers in their efforts in improving their e-commerce activities via TikTok platform. Avenues for forthcoming research were discussed as well.

Keywords Perceived ease of use · Perceived usefulness · TikTok · User satisfaction · Trust

1 Introduction

The e-commerce adoption has been expansively studied, as demonstrated by Kiwanuka (2015), Williams et al. (2015), and it has been countlessly reported, for instance, by Venkatesh et al. (2003) that the behavior of individuals during their online purchase is majorly influenced by intrinsic and extrinsic variables and also by variables associated with the features of the new technology no matter the form of

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_14

electronic commerce (e-commerce), product or service. Equally, as stated in Sánchez-Torres et al. (2017), Torres and Cañada (2016), notable differences associated with the digital divide appear to exist in this technology diffusion within various world regions. This is particularly salient when looking at issues relating to the infrastructures, access to information and communication technologies or ICTs, high access tariffs, the internet network, and training in the technology's usage, which adversely impact the adoption of user of e-commerce (Landau, 2012).

The actual impact of the digital divide on virtual channel usage has been examined in several studies. For instance, in a study carried out by Muñoz and Amaral (2011), it was found that elderlies face more difficulties in technology usage owing to the lack of training, as they had no experience in the use of the technology for the most part of their lives. Additionally, the imposed regulation, infrastructure, and the market are among the factors found to impact the access of people to e-commerce. Many macroeconomic studies carried out by international organizations have been examining the aforementioned form of digital divide, in relation to the growth and development (Deursen & Dijk, 2013; Hilbert, 2016; Obeidat et al., 2017; Peral-Peral et al., 2015; Pick & Nishida, 2015; Tarhini et al., 2015; Wei et al., 2011; White et al., 2011). Somehow, in relation to the models of e-commerce adoption, this phenomenon has not been closely examined.

Among developing nations especially, the integral role of information and communication technologies (ICT) in socio-economic development, has led governments, non-government bodies as well as International Telecommunication Union (ITU) to fund Telecentres (Sey & Fellows, 2009). For the facilitation of local community development, Telecentres make available to the general public, the access to computers as well as the associated ICTs (Gurstein, 2007). As mentioned by the International Telecommunication Union, all over the world in total, only 26.6% of the citizens have homes internet access. Somehow, these people were mostly those living in developed countries (Clark & Gomez, 2011). Notably, the past twenty years have demonstrated the commonness of public computers and the Internet accessibility by way of Telecentres platform (Clark & Gomez, 2011). The use allows the sharing of network resources among various users, for instance, the sharing of communication lines, and this has allowed ICTs to be expanded to many other users. Meanwhile, the term "Telecentres" that is used in this study for the context of Jordan encompasses a wide concept, and the term is referred differently in different countries.

Various Telecentres which provide training in information and communication technology are available in Jordan. These centers can be found in various cities in the country including Irbid, Balqa, Zarqa, Tafelah, and Amman as well (Amman is the capital city of Jordan). Essentially, Telecentres are for promoting digital literacy, easing digital divide and poverty, providing prospects of employment to the people, in addition to being part of the e-governance and the e-commerce initiatives (Andersson & Grönlund, 2009). There are indeed various advantages of Telecentres, and yet, these Telecentres have not been receiving the appropriate academic interest especially in terms of its user acceptance and use (Sey & Fellows, 2009).

Notably, with the application of a modified form of unified theory of acceptance (UTAUT) and technology acceptance model (TAM), several determinants of potential users' acceptance of Telecentres have been mentioned in several past studies within the context of developing nations (Al Kurdi et al., 2020a, b; Almajali, 2021a; Alshurideh et al., 2019a, b; Davis, 1989; Wang & Shih, 2008). Considering the above discussion, an exploratory study should be carried out, to ascertain whether or not the digital divide impact on the adoption of e-commerce in a negative manner. Relevantly, Almajali et al. (2021) in their study have mentioned the need to explore the applications of social media that appeal to millennials, and TikTok is one of these applications. As with certain other applications, TikTok also allows user to engage in e-commerce activities.

Sensor Tower accordingly reported that TikTok was downloaded over 188 million times in the first quarter of 2019. Indeed, TikTok is social media App that has been downloaded the most frequently all over the world (Al-Maroof et al., 2021; SensorTower, 2019), and its solid technical strength and good product experience makes TikTok appear usable to various users. TikTok is a free platform that allows user to express them and establish new relationships (Omar & Dequan, 2020). Among the major elements of TikTok found to be highly attractive among its users include its "music dubbing," "funny story," and "mind relaxing" (Ma et al., 2019). In China, Provincial Health Committees and other authorities have registered official accounts on TikTok (Zhu et al., 2021). TikTok has indeed rapidly expanded its user base.

TikTok encompasses Social Network Sites (SNSs) encompassing common platforms of social media (Almazrouei et al., 2021; Alyammahi et al., 2021). The internet realm and communication methods have been transformed by social sites. Videos and the experiences shared affect the life of people (Alqudah et al., 2021; Chatzoglou et al., 2020). TikTok has recently introduced a micro-video feature in its technology, and during the pandemic of COVID-19, governments all over the world employed short videos in their efforts of disseminating the news associated with the disease. TikTok in this regard is viewed as a fitting application that makes available to user the short video socialization, and as can be observed in China, TikTok has been a major application in the dissemination of countless of topics to the public (Al-Maroof et al., 2020; Wang & Fu, 2020; Zhu et al., 2021).

Notwithstanding the great opportunities offered by TikTok in data sharing and exchanging as highlighted in Mhamdi et al. (2018), Salloum et al. (2018), the effectiveness of TikTok as a key source within the domain of e-commerce that compels its users to accept the technology has not been sufficiently explored, as indicated in several studies (Salloum et al., 2017, 2018; Aburayya et al., 2020; Abu Zayyad et al., 2020; Al-Dmour et al., 2017, 2020; Alhashmi et al., 2019, 2020; Alshurideh, 2018). Utilizing a conceptual model for evaluating users' acceptance, the present study looks into the factors that can inspire users to gain from this platform.

In past studies on TikTok, the examined variables include travel intention (Bian & Zhu, 2020), purchase intention (Wang, 2019), usage motivation (Omar & Dequan, 2020), information service quality involving the Chinese government accounts on TikTok (Chen & Zhang, 2020), and intention to continue using TikTok (Susilo, 2020). On the other hand, the impact of TikTok usage on the positive emotion and

relationships among e-commerce customers has not been examined especially in the setting of Jordan, and this has created a significant gap. As such, the present study will explore how TikTok usage would influence positive emotion and relationship among e-commerce customers in Jordan.

A comprehensive model was constructed involving several external factors associated with the platform of TikTok, and among the external factors included in the model are content richness, readiness to trust new technology, and user satisfaction. Content richness relates to the wealth of the content, time restriction as well as the latest information. Readiness to trust new technology and users' satisfaction are the other two factors included, and these factors are associated with the customers themselves (Al-Dmour et al., 2021; Alshurideh, 2022; Kurdi et al., 2020). Essentially, the main purpose of carrying out the present study was to examine the acceptance of customers towards TikTok usage, and thus far, the literature has not provided any evidence on past studies that examined TikTok as an e-commerce platform. Accordingly, a conceptual framework that measures customers' acceptance towards TikTok as a social media platform was constructed. This framework specifically examined the status of digital divide in Jordan, alongside its impact on the platforms of e-commerce including TikTok.

2 Literature Review

TikTok have previously been examined but past studies on this subject were mostly looking at different important factors impacting TikTok acceptance in both the educational (Al-Maroof et al., 2020) and non-educational contexts. In education, Kurdi et al. (2020), Habes et al. (2019) reported that this application has been playing the role of a learning tool. The impact of different factors such as motives and benefits on the acceptance of users especially educators and students, towards TikTok were accordingly investigated. Comparatively, TikTok has been examined in non-educational settings, specifically to ascertain its impact on the settings outside of universities and schools. The present study therefore measured the effectiveness of Tiktok social media platforms in understanding the acceptance of customers in the domain of e-commerce.

A conceptual framework was accordingly constructed in the present study. The framework measures users' acceptance of TikTok social platform. The extrinsic and intrinsic tasks were currently distinguished by scholars, whereby the former is associated with the information system that supports in-built goal accomplishment, while the latter encompasses tasks that are applied in extracting the various types of information, delivered in video format, that customers can view and share at will (Gefen & Straub, 2000; Ryan & Deci, 2000). Accordingly, TAM was applied here in this study in the illustration of the process of customer acceptance (Davis, 1989). Here, the constructs of perceived usefulness and perceived ease of use are considered as part of extrinsic type of motivation. The constructs of customer satisfaction, Trust, and content richness were added to TAM as they could add to the acceptance of TikTok,

as has been demonstrated in Ong and Lai (2006), Pituch and Lee (2006), Sánchez and Hueros (2010).

2.1 Development of Research Hypotheses and the Conceptual Model

Content richness encompasses resources of learning which ease knowledge acquirement and use. In view of that, adequate amount of content richness will increase the readiness of customers to accept the technology. The three key constructs of content richness are relevance, sufficiency, and timeliness. Specifically, relevance entails the manner in which the shared content has value, while sufficiency means the manner in which the shared content demonstrates comprehensiveness and illustrates a cohesive concept, whereby timeliness relates to the competebailable the most recent development information within the required content to its users (Jung et al., 2009; Sánchez & Hueros, 2010; Tung & Chang, 2008; Wulf et al., 2006).

Content richness has a clear direction with technology acceptance. It was reported by De Wulf et al. (2006) that content positively affects customer's acceptance of technology. Also, it was reported that higher content richness leads to the increase in usefulness and users' satisfaction, and thus, technology acceptance. As mentioned in related studies including Jung et al. (2009) high level of content richness will make the technology very useful. As for the construct of timeliness, it was found that outdated content is less useful, and thus, elements that are time-sensitive will impact the perception of user towards the technology. The following hypotheses are thus formed:

H1: Content richness has a positive impact on user satisfaction.

H2: Content richness has a positive impact on TikTok acceptance.

Trust

As a concept, trust has been described in various perspectives (McKnight et al., 2002). In Mayer et al. (1995), the notion of trust was described as the manifestation of persistent views from the actions of rivals, while Doney and Cannon (1997) described the concept as the confidence felt by someone towards others. Within the context of online business, the impact of trust has been examined as in Doney and Cannon (1997), Mayer et al. (1995), Jones and Leonard (2008). Gaining trust of consumer is ab challenging task for companies (Kim & Park, 2013), and it has been reported that the online purchase decisions of consumer is impacted by trust (Almajali, 2021b; Hajli, 2012) Equally, purchase intentions of consumer have been shown to be greatly affected by trust (Kim, 2011; Kim et al., 2008). Relevantly, in online businesses, Kim and Park (2013), Kim et al. (2008) and Mikalef et al., (2013) concluded that word of mouth (WOM) and low prices are among the two factors that affect trust.

A solid link between trust and satisfaction was concluded in Bauer et al. (2002), and as highlighted in Kennedy et al. (2001), the company is obliged to fulfill the needs and wants of its consumers. Notably, when consumer experiences desired expectations, he or she expresses satisfaction (Anderson & Sullivan, 1993). Satisfaction is dictated by the initial expectation of consumer (Anderson & Sullivan, 1993; Beyari & Abareshi, 2018). and for this reason, satisfaction is quantifiable through what is wanted by consumer and by whether (or not) the consumer attains the tangible aspects, including security of web system, delivery time, in addition to the intangible aspects, for instance, feelings of happiness and joy, or anger after the completion of purchase of a given product or service (Ashraf et al., 2017; Flavián et al., 2006). As indicated in Flavián et al. (2006), consumer will feel a sense of satisfaction when the sense of trust is high, when there is honesty, and when the website is viewed as competent. Trust thus becomes an element that significantly impacts consumer satisfaction in their intention to make purchase from certain website (Kim & Park, 2013).

In the adoption of a given technology, Gefen et al. (2003) stated trust as a key driver considering that trust is integral in dealing with two important provisos of digital means namely vulnerability risk and uncertainty (Doney & Cannon, 1997; Gambetta & Gambetta, 2000). Within the context of e-commerce, trust is crucial (Harris & Goode, 2004). This owes to some issues associated with conveyance of electronic service including the dynamicity of the environment, inexpert user (Ruyter et al., 2001), in addition to the non-existence of direct interaction. Furthermore, within the context of electronic services, trust has been explored in the context of e-commerce for instance in McKnight et al. (2002), Gefen et al. (2003). The notion of trust in the context of online behavior is important in understanding user acceptance towards electronic services (Carter & Weerakkody, 2008). The hypotheses below are therefore proposed:

H3: Trust has a positive impact on user satisfaction.

H4: Trust has a positive impact on TikTok acceptance.

User Satisfaction

User satisfaction is the level to which user feels pleased and satisfied in technology usage. In general, scholars perceive user satisfaction as an attained result that is manifested through the emotion towards the use of a given technology. In other words, it is possible that user would perceive a given technology as satisfying even when they have no preference towards it (Liao et al., 2009; Szymanski & Hise, 2000; Wixom & Todd, 2005). Additionally, Alshurideh et al. (2012) found positive influence of user satisfaction positively on e-service usage. Reporting similar result, Ashraf et al. (2017) added that such positive impact has direct linkage to both perceived usefulness and perceived ease of use. Relevantly, Al-Hawari and Mouakket (2010), George and Kumar (2013) and Teo (2011) mentioned user satisfaction as a prominent factor impacting the acceptance of technology (Liaw, 2008 (notably mentioned that higher level satisfaction will increase the inclination of user to use the technology. On

the other hand, low satisfaction level will reduce the inclination of user towards technology acceptance or usage. As such, the hypothesis to be tested is:

H5: User satisfaction (US) has a positive impact on TikTok acceptance.

Technology Acceptance Model

Technology Acceptance Model (TAM) is an acceptance model that has been commonly applied in scholarly works relating to acceptance and adoption of technology in countless of domains. TAM, as mentioned in some studies (Agarwal & Karahanna, 2000; Niederhauser & Perkmen, 2010), has been effective particularly in measuring the successfulness of a given system and the outcomes of an experience in question. In this regard, two leading constructs of TAM, namely perceived ease of use (PEOU) and perceived usefulness (PU) have been shown to impact the socio-technical aspects, and these constructs have been applied in examining users' behavioral intention in utilizing a given system. These constructs greatly facilitate researcher in the comprehension of users' attitudes or beliefs toward a given information system. Both constructs relate to the level to which user is sure that the system is not only easy to use, but useful as well (Davis, 1989), and past studies (Alshurideh et al., 2020; Krejcie & Morgan, 1970; Limayem et al., 2001; Teo, 2011) reported that these constructs greatly impact the acceptance of technology and the behavioral intention towards its usage. The hypotheses below are therefore presented:

H6: Perceived ease of use (PEOU) positively impacts the acceptance of TikTok.

H7: Perceived usefulness (PU) has a positive impact on the acceptance of TikTok.

3 Research Methodology

The research methodology is discussed in this section, specifically covering the discussion on the research model proposed, the variables involved in this study, the research hypotheses, the instrument used in gathering the study data, the research population and sample, as well as the data analysis and result.

3.1 Research Model

The study model as illustrated in Fig. 1 displays the used variables and the proposed linkage between them.

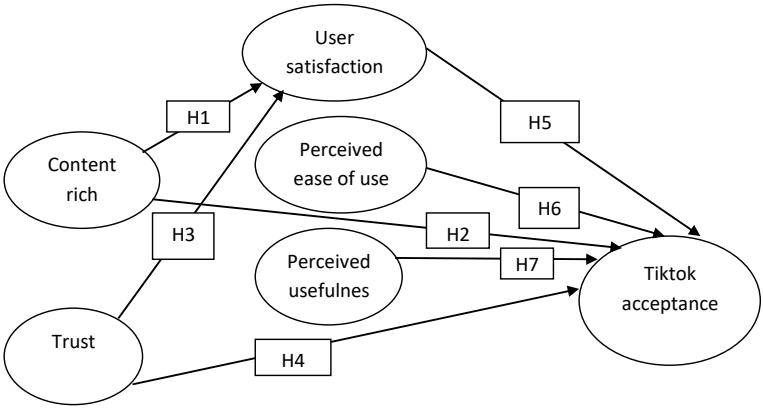

Fig. 1 Research model

3.2 Data Collection

This descriptive-analytical study adopted a deductive technique involving a cross-sectional design. Meanwhile, the data were obtained from the study questionnaires which were dispersed to the respondents online. The respondents in this study were users of Telecenters in Jordan. The study duration began on 15th March 2021 and ended on 20th June 2021. The questionnaire link was sent to the respondents through official emails and social media channels, including WhatsApp. The samples of the study were chosen using stratified random sampling methods. Jordan has various Telecentres (www.ks.gov.jo), and 196 were involved in this study. From these 196 Telecentres, 51 were in rural areas, 68 were operating in a semi-urban area, while 77 Telecentres were operating in an urban area.

This study distributed a total of 200 questionnaires, 145 of which, or 72%, were usable for analysis. Structural equation modeling techniques run with AMOS 22 were used in testing the proposed research model. The individuals made up the study's unit of analysis, and they were chosen for this research as they were the end-customers of ecommerce. The use of individuals as key respondents was also demonstrated in past studies including. In terms of sample size, the current study followed the suggestion of Chuan and Penyelidikan (2006). Here, the appropriate sample size was based on the collective number of 145 valid responses as 132 respondents are the expected sample size for a population size of 196. Structural Equation Simulation (SEM) was used in the evaluation of the sample size (Bagozzi & Yi, 1988), as the hypothesis validation. Table 1 accordingly presents the characteristics of the respondents, particularly in terms of their gender, age, level of education and experience of social media usage.

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Table 1 Demographic data of the respondents

Demographic	Factor	Frequency	Percentage (%)
Gender	Female	90	62
	Male	55	38
Age	18–29	70	48
	30–39	40	28
	40–49	20	14
	50–59	15	10
Education level	Diploma	100	69
	Bachelor degree	10	7
	Others	35	24
TikTok usage frequency	Less than 10	15	10
	10–30	40	28
	More than 30	90	62
	Total	145	100

3.3 Demographic Information

Table 1 presents the demographic data of the respondents. As can be viewed, females made up 62% of the overall respondents, while males were the remaining 38%. In terms of age, 48% were between 18 and 29 years, while the remaining 52% were above 29 years. As for the level of education of the respondents, the table shows that: 7% obtained a bachelor's degree, 69% had diploma, and 24% were holders to other types of paper qualification. In the use of TikTok in a day, the majority stated that they used it more than 30 times, while 28% stated that they used the application between 10 and 30 times, whereas 10% indicated the use of Tiktok of less than 10 times in a day. The IBM SPSS Statistics version 23 was employed in the demographic data measurement.

3.4 Study Instrument

The study's proposed hypotheses were validated through the use of data obtained through a survey instrument, namely questionnaire. There were six constructs included in the questionnaire represented by 22 items (see Table 2). The items were adopted from past studies, and each item employs 5-point Likert scale, from the score of 1 to denote "strongly disagree" to the score of 5 to denote "strongly agree." A pre-test was carried out on the initial instrument. For the purpose, three semi-structured interviews involving TikTok users and five Department of Management Information

Table 2 Measurement items

Constructs	Items	Instruments
TikTok acceptance	TA1	Using TikTok is highly preferred for e-commerce activities
	TA2	Using TikTok is highly preferred for customers in the e-commerce environment
	TA3	Using TikTok is more preferred than other social media platforms
User satisfaction	US1	In general, my experience with TikTok as a customer was satisfactory
	US2	In general, my experience with TikTok satisfied all my needs as a customer
	US3	In general, my experience with TikTok is more satisfactory than on other social media platforms
Perceived ease of use	PEOU1	I think that TikTok is easy to use compared to other e-commerce activities
	PEOU2	I can easily find the information I need with TikTok
	PEOU3	I think that TikTok can replace other social media platforms due to its ease of use
Perceived usefulness	PU1	I think that TikTok helps in the acquirement and sharing of e-commerce information among customers
	PU2	I think that TikTok improves my desire to get new e-commerce information regularly
	PU3	I think that TikTok is more useful than other social media in the application of the e-commerce
Content richness	CR1	TikTok provides customers with sufficient content for e-commerce activities
	CR2	TikTok is rich with e-commerce content as compared with other social media platforms
	CR3	TikTok has the latest e-commerce information that can be shared and applied in e-commerce environment
	CR4	TikTok's short videos are more satisfactory than those presented on other social media platforms
	CR5	TikTok has provided customers with sufficient e-commerce information whenever they need it
	CR6	TikTok has provided customers with sufficient e-commerce activities whenever they need it
	CR7	TikTok has more sufficient e-commerce information than other social media platforms
Trust	TR1	I trust this TikTok platform
	TR2	This TikTok is reliable
	TR3	This TikTok is trustworthy

Systems (MIS) professors from the applied science private university. The purpose of this pre-test was to ascertain the completeness, relevance, clarity, and length of the questionnaire. Several necessary adjustments were made after the pre-test.

4 Data Analysis and Results

4.1 Measurement Model

AMOS software version 22 was applied in the hypotheses examination, involving the use of Confirmatory Factor Analysis (CFA). CFA determines whether the data fits the conjectured measurement model. Next, the proposed structural model was examined using Structural Equation Modelling (SEM) involving the use of path analysis with latent variables as demonstrated in Hair (2007), Kline (2011) and Newkirk and Lederer (2006). Accordingly, the model fit was accomplished through the execution of a robust statistics test for instance, x^2/ degrees of freedom (df), the Incremental Fit Index (IFI), Tucker-Lewis Index (TLI), Comparative Fit Index (CFI), Goodness-of-Fit Index (GFI), Adjusted Goodness-of-Fit Index (AGFI), and the Root Mean Square Error of Approximation (RMSEA). In this regard, Table 3 can be referred. In this study, the preliminary CFA model failed to show sufficient fit, resulting in the removal of items US3, CR3 and CR6, to improve the fit for the measurement model, with the following: the chi-square (x^2/df) value of the model = 1.86, IFI = 0.82, TLI = 0.83, GFI = 0.80, CFI = 0. 81 and RMSEA = 0.075. The form of measurement consequently demonstrated adequate fit to the data, as was also demonstrated in Hair et al. (2014), Kline (2011) and Newkirk and Lederer (2006).

The internal consistency of multi-item constructs was determined through Cronbach's Alpha evaluation. Creswell (2009) accordingly recommended that the value should be greater than 0.6, while Larcker et al. (1981) proposed by a factor loading of greater than 0.6 to the research items. Hair (2007) stated that all constructs should have composite reliabilities that are greater than the threshold value of 0.6. Additionally, Hair (2007) and Larcker et al. (1981) mentioned that the Average Variance Extracted (AVE) from a set of measurements of a latent variable should be greater than the value of 0.5. Table 4 accordingly displays the outcomes of Cronbach's Alpha, composite reliability, factor loadings, and AVE for the present study's research variables.

For all constructs in this study, based on Hair (2007), Larcker et al. (1981) and Ryu et al., (2009,(the attained Cronbach's Alpha was greater than 0.7, while the

Table 3 Measurement model fit indices

Model	x^2	Df	P	x^2/df	IFI	TLI	GFI	CFI	RMSEA
Initial Estimation	1321.114	521	0.00	2.53	0.71	0.70	0.77	0.74	0.121
Final model	641.122	343	0.00	1.86	0.82	0.83	0.80	0.81	0.075

Table 4 Properties of the measurement model

Construct	Standard loading	Standard error	Square multiple correlation	Error Variance	Cronbach's Alpha	Composite reliability	AVE
TikToK acceptance					0.86	0.96	0 0.91
TA1	0.751	0.083	0.075	0.043			
TA2	0.611	0.106	0.220	0.061			
TA3	0.559	0.084	0.470	0.031			
User satisfaction					0.83	0 0.96	0 0.86
US1	0.525	0.088	0.239	0.050			
US2	0.587	0.112	0.441	0.034			
Perceived ease of use					0 0.70	0 0.87	0.77
PEOU1	0.572	0.095	0.078	0.045			
PEOU2	0.504	0.115	0.085	0.066			
PEOU3	0.536	0.142	0.103	0.027			
Perceived usefulness					0.90	0.94	0.93
PU1	0.617	0.90	0.117	0.022			
PU2	0.573	0.360	0.371	0.057			
PU3	0.547	0.107	0.145	0.65			
Content richness					0.78	0.80	0.84
CR1	0.738	0.055	0.491	0.701			
CR2	0.693	0.073	0.394	0.627			
CR4	0.680	0.052	0.562	0.751			
CR5	0.544	0.050	0.612	0.780			
CR7	0.502	0.068	0.617	0.783			
Trust					0.82	0.94	0.81
TR1	0.622	0.068	0617	0.786			
TR2	0.589	0.069	0.711	0.843			
TR3	0.561	0.215	0.419	0.027			

*Applying Larcker et al.'s (Larcker et al., 1981) formula, the computation of composite reliability is based on the following: Composite Reliability $= (\Sigma \text{ Li})^2/\left((\Sigma \text{ Li})^2 + \Sigma \text{ Var (Ei)}\right)$, where Li denotes the standardised factor loadings for each indicator, and Var (Ei) denotes the error variance related to the individual indicator variables

**The formula for the variance extracted is: Average Variance Extracted $= \Sigma \text{ Li}^2/\left(\Sigma \text{Li}^2 + \Sigma \text{Var(Ei)}\right)$ where Li denotes the standardised factor loadings for each indicator, while Var (Ei) denotes the error variance related to the individual indicator variables.

indicators of the factor loadings were all greater than 0.50, which means that the items had convergent validity. Furthermore, the fact that all AVE values obtained in this study were greater than 0.50 was denoting convergent validity, as proposed in Creswell (2009) and Hair (2007). Table 4 accordingly displays the attained means, standard deviations, AVEs, and the square of correlations together with the respective constructs. As demonstrated by the findings, the relationships between construct pairs were smaller compared to the square root of the estimates of the AVE of the two constructs. Based on Creswell (2009), there is discriminant validity.

Minimum recommended value $x^2/df = 1$; IFI = 0.80; TFI = 0.80; CFI = 0.80; GFI = 0.80; AGFI = 0.80; RMSEA = 0.05.

4.2 Structural Model

As shown by the following Table 5 on the outcomes of SEM analysis, content richness imparts a significant positive and direct impact on user satisfaction (β = 0.206, C.R = 2.420, p = 0.006), denoting support to H1. The results also support H2 by demonstrating the significant positive and direct impact of content richness on TikTok acceptance (β = 0.513, C.R = 7.211, p = ***). Trust imparts a positive significant effect on user satisfaction (β = 0.175, C.R = 3.042, p = 0.002). Hence, H3 was supported. For H4, the results affirm the positive and significant direct impact of trust on TikTok acceptance (β = 0.110, C.R = 2.138, p = 0.032), and therefore, H4 was supported. Further, the results demonstrate a positive direct impact of user satisfaction on TikTok acceptance (β = 0.114, C.R = 2.312, p = 0.041), which means that H5 was supported. In examining H6, the results show significant positive direct impact of perceive ease of use on TikTok acceptance (β = 0.141, C.R = 2.411, p = 0.018), denoting support to H6. A positive direct impact of perceived usefulness on TikTok acceptance was shown by the results (β = 0.111, C.R = 2.444, p = 0.035). As such, H7 was supported.

Table 5 Summary of the proposed results for the theoretical model

Research proposed paths	*t*-value (CR)	Coefficient value (std. estim)	*P*-value	Decision
CR ⇒ US	2.420	0.206	0.006	Supported
CR ⇒ TA	7.211	0.513	***	Supported
TR ⇒ US	3.042	0.175	0.002	Supported
TR ⇒ TA	2.138	0.110	0.032	Supported

(continued)

Table 5 (continued)

Research proposed paths	*t*-value (CR)	Coefficient value (std. estim)	*P*-value	Decision
US ⟹ TA	2.312	0.114	0.041	Supported
PEOU ⟹ TA	2.411	0.141	0.018	Supported
PU ⟹ TA	2.444	0.111	0.035	Supported

(***$P \leq 0.005$, **$P \leq 0.01$, *$P \leq 0.05$)

Notes Path = Relationship between independent variable on dependent variable; C.R = Critical ratio; S.E = Standard error; P = Level of significance.

Note CR: Content Richness, TA: TikToK acceptance, TR: Trust, US: user satisfaction, PEOU: Perceived ease of use, PU: Perceived usefulness

5 Discussion

The literature review evidences the significance of social media within the learning environment, and some factors have been found to significantly impact social media acceptance (Oum & Han, 2011; Wang, 2020). Notably, the major determinants in TikTok acceptance for e-commerce activities were highlighted in this study. In addition, the status of digital divide among users was ascertained, especially within the context of Jordan. The vision of TikTok was expanded in this study by delving into e-commerce activities via this application. The results obtained demonstrate the positive impact of content richness on user satisfaction, showing support to H1.

In a related study, Yang and Zilberg (2020) looked into the impacts of features of short-form videos on the psychological and acceptance of users towards TikTok, and reported the ability of TikTok's short videos in greatly improving the acceptance of users. Such acceptance was attributed to the wide-spread humor feature. Contrariwise, the present study found that TikTok contains more general information generated by non-expert users, and these users created the information just to pass the time. Initially, TikTok was created for just socialization and self-expression, allowing users to share funny and merry emotions, with no regard to the content type being (Boyinbode et al., 2017). Content creators do exist on TikTok but they appear to be focusing on the general topics only. In other words, there is no specialized type of content for e-commerce users.

In addition, content creators in TikTok upload their content merely to pass time. This is different from their counterparts on other social media platform who are more specific in their content type. Another point worth noting is that TikTok video creators are generally uninterested in the issues associated with e-commerce. Notably, TikTok has been known as a platform that hosts short inspirational unspecialized videos that inspire and bring joy to people. In other words, TikTok videos are able to create a positive atmosphere. Additionally, as highlighted in Boyinbode et al., (2017), influencers in TikTok were mostly individuals in the age group of 13–64 years old, meaning that these influencers encompass teenagers, young or middle-aged adults.

Referring to H2, this study found positive impact of content richness on Tiktok acceptance. H2 was therefore supported. Additionally, past related studies have also

reported the important role of content richness on TikTok acceptance, as it impacts the keenness of user to consistently utilize social media. As such, governments and companies should create superior social media content to entice more users. Kuan and Bock (2007) relevantly reported content richness as a significant determinant of WhatsApp acceptance, as this application offers its users up-to-date information.

In discussing H3, this study found positive impact of trust on user satisfaction, and thus, H3 was supported. Relevantly, past studies have found that trust of high level among consumers would cause them to have more intention to purchase the goods and services, in this study context, purchase them online. In their study, Paulov (2003) reported trust as a major factor in testing the elements affecting consumer satisfaction.

The obtained results suggested a positive impact of trust on Tiktok acceptance, and thus, H4 was supported. As shown in past studies, trust impacts user behavior in technology adoption (Abuhashesh et al., 2019; Gyampah, 2004; Masa'deh et al., 2014, 2018; Stoel, 2009; Wang et al., 2007). In other words, untrusted service provider will prevent customer from accepting the provided service. Meanwhile, trust towards the acceptance of TikTok will decrease the effort in verifying, monitoring and controlling the service interaction. Contrariwise, low level of trust will cause customer to focus more on evaluating the service as a way to prevent opportunism on TikTok acceptance.

Results on H5 show the positive effect of user satisfaction on Tiktok acceptance, and thus, H5 was supported. Studies have reported user satisfaction as the pivotal factor underpinning the intention to use technology. For this reason, user satisfaction has been linked to long term usage, rather than the initial acceptance. Also, this factor has been regarded as a critical factor in the measurement of the satisfaction level within the domain of e-commerce, whereby motivation and commitment were found to impact the effectiveness of the information. Pertinently, past studies have shown that high level of satisfaction contributes to the constant acceptance of technology (Deci, 1985; Masa'deh et al., 2014; Shee & Wang, 2008; Wu et al., 2010).

The results demonstrate a significant influence of perceived ease of use and perceived usefulness on Tiktok acceptance, which means that both H6 and H7 were supported. The acceptance of TikTok is significantly justified through TAM. Further, perceived usefulness is regarded as a direct predictor of behavioral intention to accept both TikTok, and this finding contradicts the proposed hypotheses. Apparently, PEOU and PU in the facilitation of acceptance are significant, and technology that is easy and useful is likely to be more accepted. TikTok has been deemed a beneficial tool in stimulating extrinsic motivation in the determination of technology usage behaviour. Acceptance might hence be directly impacted by goal-oriented behaviour efforts (Lee & Lehto, 2013; Shang et al., 2005). In this study, user satisfaction was added to TAM as it has been found to have a direct linkage to the actual and practical experience of users.

5.1 Theoretical and Practical Implications

At present, TikTok is the most popular social networks among users globally, and it has been deemed the most entertaining short video-sharing app. Its brief time and content, as highlighted in Lee and Lehto (2013) and Yang and Zilberg (2020), has captured the interest of millions of viewers. In theory, e-commerce customers would enjoy the use of TikTok as a source of information. For this reason, the prospect of providing more specialized and current videos that will improve the activities and experience of customers should be increased. As videos on TikTok are short, they add knowledge to users but in restricted manner, and according to Boyinbode et al. (2017), its ability to provide enjoyable experience to user is the only striking feature of TikTok. It is thus important that the content is evaluated in order that creators of content of TikTok could produce information that is richer, up-to-date and specialized.

In practice, website developers should be concentrating on the generation of features that could facilitate the classification of the short video in order that the target users could be reached more easily. It has been recently reported that as a platform of social media, TikTok alongside its mobile short video features can indeed enrich the knowledge and experience of users. In this regard, developers of TikTok need to consider that videos with time duration that is too short may limit knowledge acquirement and experience of user, and thus, more features should be added in order that users in e-commerce domain could continue using TikTok.

5.2 Limitations and Suggestions for Future Studies

Several limitations have been identified in this study. Firstly, only one type of social network was addressed in this study namely TikTok. On the other hand, there are various other platforms with comparable functions like Reels. As such, these other platforms could be examined in future studies, particularly in terms of their effectiveness in the e-commerce context. Secondly, as this study was addressing the present conception and perception customer of TikTok, next studies may consider looking into the continuous intention to use such platform on long-term basis. Thirdly, considering that Jordanian customers were the sole respondents of this study, the results may not be generalizable to customers in other countries. As such, future studies should include customers in other countries in order that comparison could be made in terms of the use of TikTok as a social network.

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The Impact of Social Media Usage on Customer Decision Making-Process in Holiday Travel Planning Context, Applied Study Among Petra Visitors

Bahaa Mohammad Alhamad, Naseem Mohammad Twaissi, Zaid Ahmad Alabaddi, and Ra'ed Masa'deh

Abstract The study aimed to explore the impact of social media usage on customer decision-making process among Petra visitors in holiday travel planning context. In order to achieve the objectives of the study, the analytical descriptive approach methodology and convenience sample technique were adopted, the researcher designed a questionnaire based on previous studies, which consisted of (33) items to gather the information from the study sample. The Statistical Package for Social Sciences (SPSS) program was used to analyze and examine the data and the hypotheses. The research hypotheses were tested using descriptive statistical methods and simple linear regression test. The main results were: There is a moderate level of using social media in customer purchase decision process among Petra visitors, where the average of using social media was (3.05) in search information phase, (3.15) in evaluation of alternatives phase, (3.54) in purchase decision phase and (3.64) in post-purchase evaluation phase. There is statistically significant impact of the using social media on customer decision making process in all phases at the significance level ($\alpha \leq 0.05$). Also, the study found that the information provided by friends, relatives or other travelers on social media tools is more trusted in comparison to other source of information. The study recommends for companies and agents engaged in tourism industry to adopt social media as a marketing strategy due to its great advantages.

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_15

Specially, After the end of the COVID-19 pandemic, so companies operating in the field of tourism are in dire need of promotional and advertising campaigns in line with the modern technologies.

Keywords Social media using · Customer decision-making process · Social media information trust

1 Introduction

The advent of the Information and Communications Technology (ICT) revolution had a major impact on tourism, so the effects of this revolution will continue to change the nature of contemporary tourism. The globalization of information, innovation and improved access also contributed to the design of a new scientific model that led to the growth of social media to be one of the most effective means for tourists to obtain information and exchange travel experiences. The digital dealings also played an effective role in the past decades, which in turn paved the way for commercial interactions between individuals on a large scale and set new directions to reshape the market (Lee et al., 2022a, b; Tariq et al., 2022a, b). The channels of communication are being transformed from being a marginal engine to the main market enabler (Fotis, 2015; Öztamur & Karakadılar, 2014) Social media has achieved tremendous success over the past years: Facebook, a social media site, has announced that "our products empower more than 2 billion users around the world to share ideas, more than 50% of them log in every daily" (Facebook, 2019), and more than 330 million monthly active users on Twitter, by average 145 million of them daily log in Statista (2019). Whereas YouTube announced that "Over 2 Billion logged-in users visit YouTube each month and everyday people watch over a billion hours of video and generate billions of views and more than 70% of them comes from mobile devices" (YouTube, 2019). And many other social media sites that have become networks for the exchange of knowledge and experience that directly affect consumer behavior by encouraging and promoting social interaction and information creation and sharing (Abuhashesh et al., 2019; Masa'deh et al., 2018; Masa'deh et al., 2013; Vinerean, 2017; Wren & Power, 2011). With this advent and growing of using ICT specially through social media as statistics seen at official websites of some social media platforms, that use may have an effect at customer decision-making process in context of travel decision and choosing destination, so this study explores this effect in new model.

On the other side, Jordan ranked only 90th out of 136 countries on the smart tourism index for the past year, despite the high technical readiness of the Kingdom, which indicates that tourism decline from the goals of the strategic plan of the Ministry of Tourism and Antiquities (2018–2020) as published on its website. Badado attributed the reasons for the decline in smart tourism to the traditional marketing of Jordanian tourist sites, as the official Jordanian promotion of tourism lacks creativity and innovation in accordance with the concept of "digitizing tourism", as well as the traditional tourism media, which was reflected on the rank of the Jordanian tourism

services on the international tourism map, due to the failure in communicating the tourism message about Jordan, with its cultural symbols and connotations (Alrowwad et al., 2020; Nairoukh, 2018). Therefore, it has become a necessary to work on research on the issue of tourism and technology to provide results and recommendations that could improve Jordan's global tourism position in line with the Ministry's strategic plans to adopt the principle of innovation in promoting Jordanian tourism.

Petra tourism city, witnessed during the past year 2019 an unprecedented tourism activity in the number of its visitors, where the number of visitors reached one million and 135 thousand and 300 visitors of all nationalities, which increased over 37 percent in comparison to the year 2018, in which the number of visitors reached 828,952 from different nationalities. The statistics issued by the Petra Development Tourism Region Authority stated that the number of foreigners was one million and 553 visitors, while the number of Jordanians and Arabs were 129,144 visitors, and student trips were 5,603 visitors, the increase in the number of foreigners is reaching to 49 percent. The active tourism movement during the past two years has made the Petra region authority work continuously to develop tourism services and improve infrastructure and organize the movement of visitors in the archaeological sites in a way that preserves the privacy of these archaeological sites and create sustainable development parallel to the overall tourism process and in various sectors (Petra Development and Tourism Region Authority annual report, 2019).

The current study results would hopefully provide a number of effective theoretical and practical implications and will attempt to Explore to what extent Petra city visitors using social media in their purchase decision making process in context of holiday travel planning; and exploring the impact of social media usage at customer decision-making process in holiday travel planning. And exploring the level of customer trust towards social media in relation to other sources of holiday related information. As a result, this study will be looking forward and try to answer the following main questions:

What is the extent of Petra city visitors using social media in their purchase decision making process in context of holiday travel planning?
How do social media impact customer decision-making process throughout the holiday travel planning?
What is the level of trust towards social media in relation to other sources of holiday travel related information?

2 Conceptual Model and Hypotheses Development

As presented in the following Fig. 1, four main aspects of (search information phase, evaluation of alternatives phase, purchase decision phase, post-purchase evaluation phase) impact of using social media on customer decision making process when choosing destination.

The following hypotheses were constructed, based on the study problem, and its various questions to achieve the objectives of the current study, they are as follows:

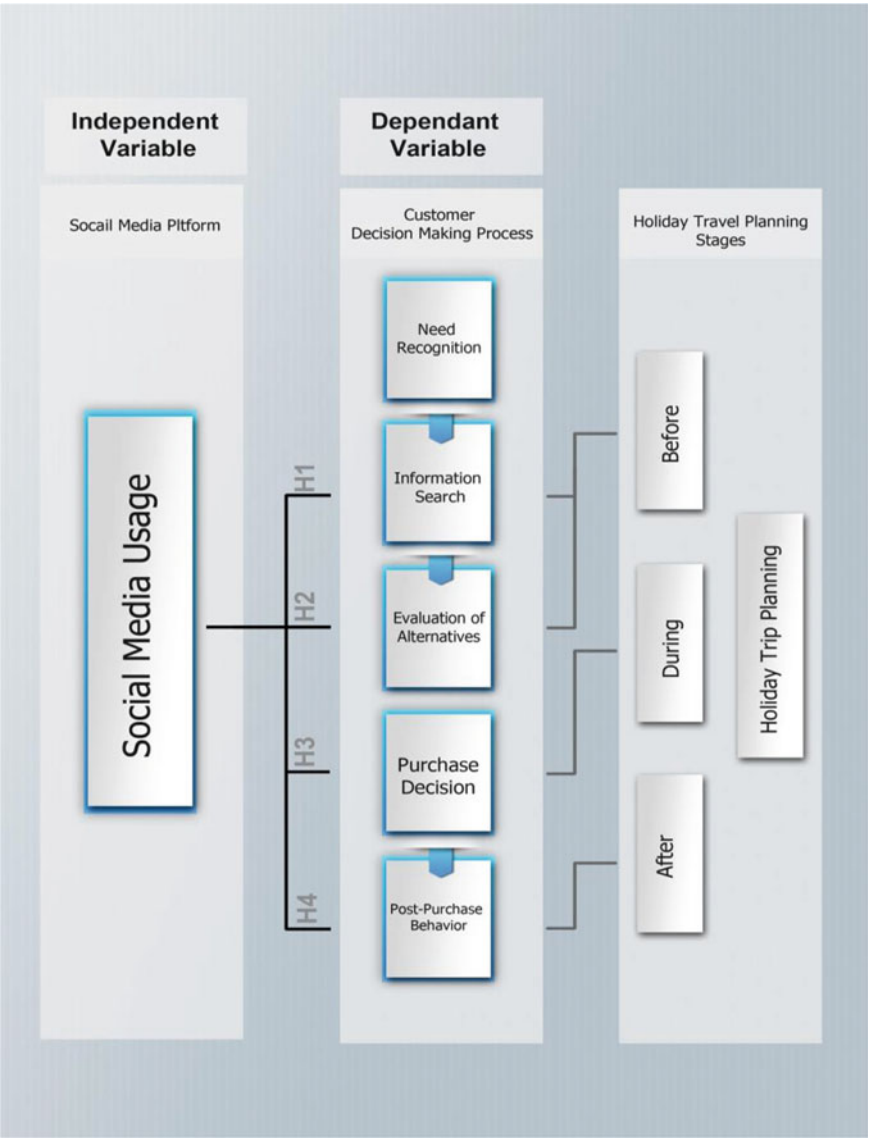

Fig. 1 Study model

H1. There is a statistically significant impact of using social media on customer decision making process in search information phase when choosing destination at the significance level ($\alpha \leq 0.05$).

H2. There is a statistically significant impact of using social media on customer decision making process in evaluation of alternatives phase when choosing destination at the significance level ($\alpha \leq 0.05$).

H3. There is a statistically significant impact of using social media on customer decision making process in purchase decision phase at the significance level ($\alpha \leq 0.05$).

H4. There is a statistically significant impact of using social media on customer decision making process in post-purchase evaluation phase at the significance level ($\alpha \leq 0.05$).

2.1 Customer Decision Making Process

2.1.1 Concept of Customer Decision Making Process (CDMP)

Author	Concept	Definition
Basil et al. (2013)	CDMP	The consumer decision-making process can be defined as the phases that consumers go through to take a final purchase decision. The task of a marketer is to focus on the whole series of the purchasing process instead of emphasizing solely on a purchase decision, because consumers experience different phases before reaching a conclusion
Kotler et al. (2005)	CDMP	A consumer decision making process includes of five stages to acquire a product or services. From the very beginning stage consumer recognize the need, gather the information and sources, evaluate alternatives and make the decision

2.1.2 Customer Decision Making Phases

The model of customer decision-making process consists of five stages/phases, these are connected tightly with each other as explained in the Fig. 2. Consumer uses all five phases during decision-making process in those products which are purchased rarely or occasionally with the high involvement. The consumer purchase goods or services with low involvement in decision making if the product is daily usage or low-cost products (Qazzafi, 2019). Every phase depends on the other one, and everyone described in details below for better understanding of the customer decision-making process:

Phase 1: Problem recognition

Every customer who wants to buy something, should go through the buying process which starts with the desire (problem recognition), in holiday travel context there

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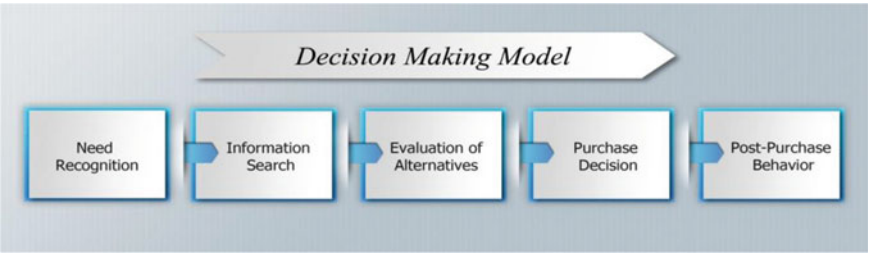


Fig. 2 Customer decision-making model (Kotler & Keller, 2012)

are some related stimuli such as pictures, videos or any other related information found on social media and these stimuli should be identified by tourism marketers to develop the right online marketing strategy and to move to the next phase (Aljumah et al., 2021; Al-Maroof et al., 2021; Alshurideh et al., 2019; Alwan & Alshurideh, 2022; ; Kotler & Keller, 2012; Kurdi et al., 2021; Obeidat et al., 2017, 2019; Tarhini et al., 2015)

Phase 2: Information search

It is the phase which seems to be the most crucial, so it provide the users/customers with the information about the available options. According to two categories which are internal and external, first one depends on the memory and previous experience of the customer his/herself. Normally, it concerns only low involvement products which are frequently purchased. When the second one is concerned with more complex product that need external search while there is a little or insufficient knowledge about them. According to Kotler and Keller (2012) there are three basic sources of external information search:

Personal, they are the people like friends and family represented by social network.
Companies, like the official websites and advertisements.
Public, represented by consumers rating platform such as forums, blogs and micro-blogs.

Phase 3: Evaluation of alternatives

During the phase of evaluation of alternatives, users interact with social media as an external source of information as well as his/her limited knowledge and skills to evaluate the right option. Social media platform could play an important role in this phase (Kotler & Keller, 2012).

Phase 4: Purchase decision

It is the phase of the actual purchase, when the customer accepts a specific option to buy after collecting information from several sources, evaluate it and decided where to purchase and what to purchase. Consumer purchase the brand or product which he/she gives the highest rank in the evaluation phase. The purchase decision also influenced by the surrounding environment who/when to buy and don't buy, and

depend on someone else experiences, price, place and offers available (Abu Zayyad et al., 2020; Qazzafi, 2019).

Phase 5: Post-purchase evaluation

It is the last phase and may be the most important phase for the organization to receive positive or negative feedback, so it comes after the customer take his/her action. The companies work doesn't stop if the customer buys a product. The companies should know the behavior or view of the consumer towards the product. After the use of the product, the customer might be satisfied or dissatisfied. If the consumer satisfied, then the chances of retention are more of the same product and satisfied consumer can also influence the other people to buy the product and vice versa (Qazzafi, 2019). In this phase social media play an important role for the company reputation and brand, so companies should take care for the whole series not just specific phase.

2.1.3 Customer Decision Making in Holiday Travel Planning Context

Moreover, when defining a tourism concepts, there is an important point should take into consideration which is consumers activities. Tourism, particularly vacation and recreation as an activity decided by the consumer his/herself independently (Dwityas & Briandana, 2017; Zeng & Gerritsen, 2014). Therefore, there is a main focus on customer behavior when talk about tourism. Study on customer behavior grows nowadays when the marketing strategies affected by social media and have been started to consider in many companies. The field of customer behavior is the study of individuals, groups or organizations and processes they use to select, decide, use as well as post-use of a product, service, experience as well as idea to meet the demand and impact of the process to customers and society (Hawkins & Mothersbaugh, 2010; Senanayake & Anise, 2019). Customer decision-making process come as an extent to customer behavior science, it can identify through these steps: desire, information search, alternatives evaluation, selection and post-purchasing evaluation. Figure 3 shows these steps throughout the three main steps in holiday trip decision which are pre-Trip, during-Trip and post-Trip (Dwityas & Briandana, 2017).

Pre-Trip phase, the phase when someone has a desire to dose a travel, and it consists of some activities such as the desire to travel, search information that related to the destination and some tourism activity, and travel decision making about purchasing some products to do travel as an airline ticket.

During-Trip phase, the phase when someone take the decision and the destination already decided and consist of some activities such as consumption of products in the scope of the tourism, like accommodation, transportation, attraction and food. It also includes searching additional information required around the scope of the tourism products and services during the trip.

Post-Trip phase, the phase when that a series of activities accomplished and the travel already has done. In short, this phase is after the travelers have come back to home, social media is usually use in this phase to share experiences and memories,

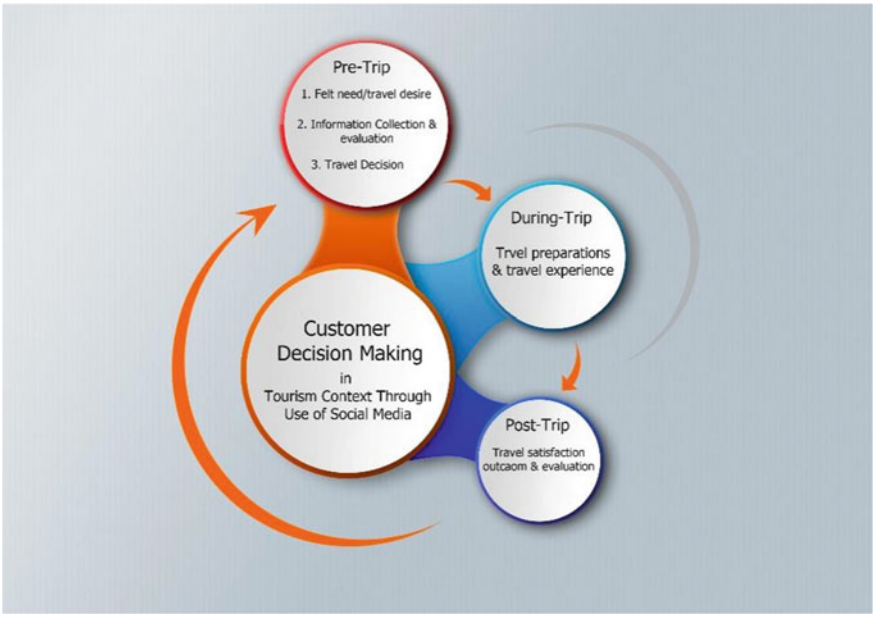


Fig. 3 Designed by researcher based on Dwityas and Briandana (2017) study

and to provide evaluation and recommendations about the destination which could be a satisfaction rate.

2.2 Social Media

2.2.1 Social Media as a Concept Definition

Author	Concept	Definition
Abd Al-samee (2012)	SC	Social media is considered as one of the most powerful tools of networking across the Internet that has connected the social with economic aspects in the real world
Smith (2009)	SC	Over the last decade. Social media has emerged as a new phenomenon, and the user generated content increased on (WWW) World Wide Web through this new technology such as social networks, blogs and media sharing platform. Collectively called social media

(continued)

(continued)

Author	Concept	Definition
Powers et al. (2012)	SC	Social media is a new platform that allows the users to connect more easily and more efficiently and it is provide the consumers with a new platform to search information and publish their opinions and experiences

2.2.2 Social Media Advantages and Disadvantages

According to Amy Looy in Social Media Management book (Looy, 2016):

Advantages

- The first advantage is speed. social media characterized by speed, it is faster in react or share content than traditional media. In addition, it is less limited to geographical distance. E.g., electronic message on social media is faster than postal letter.
- The second advantage is scalability, this means the organizations can reach more people in a lower budget. This advantage is useful to SMEs Small and Medium Enterprises.
- Third one, monitoring social media and analyzing data are less expensive than collecting information from customer through face-to-face interviews.
- Last one, interactivity between parties instead of traditional interactivity between organization and its customer through Ads or publish information on official websites.

Disadvantages

- First, social media are still new technology, many organizations are still learning how to create business value and take social media advantage in proper way.
- Second, social media content has some degree of undeletable due to the reason of the ability to electronic backup. Social media users could have a stored copy of the content deleted elsewhere.
- Lastly, privacy still the biggest concerns matter on social media. Due to ethical and legal issues. For instance, regarding to sell information about the customers to third parties.

2.2.3 Types of Social Media Platform

This study introduces the travel related social media as six types: blogs, microblogs, content community sites, consumer review sites, forums and social network sites.

Blogs

Blogs as a type of social media are considered as personal website (maybe stand alone or hosted at specific platform such as blogger/http://www.wordpress.com). It contains information about personal diary, personal experiences, thoughts, stores or ideas in a personal or informal style. Blogs provide a costumer with platform that enable publishing personal impression and communicate ideas (Fotis et al., 2011). In our tourism context, blogs are contributing to share visitors their experiences.

Microblogs

Microblogs are considered small blogs that contain limited characters, individual image, or video link. Best example of microblogs is twitter application and WhatsApp status. Twitter is an application that limits the users in 140 letters called tweet. According to Fotis (2015), all micro-blogging applications share three characteristics: (A) Short messages, limited to a specific number of characters, (B) instant message delivery, usually supported via multiple platforms, (C) users subscribe to users to receive posts.

Social Network Sites (SNS)

It is the most popular social media to share posts and experiences. It is a platform that provides the users/consumers to publish text, images and videos about their experiences, opinions and feelings through posts, reviews and comments. The best examples of social network sites are Facebook, Instagram, Snapchat, Pinterest and LinkedIn. In Fig. 4 some statistics on Ebizmba.com. (2020) about the most popularity social network sites (SNS).

Content Communities

Content communities are web-based applications that enable users to share media content such as videos, photos, documents and presentations, music and web links (Fotis, 2015). YouTube is the most popular content community website, with‖1,850,000,000—Unique Monthly Visitors ‖ according to Ebizmba.com. (2020).

Consumer Review Websites (CRW)

It is a platform where user can upload products/services related reviews and ratings by her/his experiences and opinions to an impressive range of features such as prices comparisons, wish-lists, multi variable ratings, advanced search, price comparisons, price history charts, buy/hold recommendations, deals ranking, merchants/retailers' evaluations, personalized shopping and more (Fotis, 2015). Those sites have obviously positive or negative influence on customer decision-making process and final purchase as many online users utterly rely on experiences of others (Hunaiti et al., 2009; Roučkova, 2015). In our context, TripAdvisor is the most popular one.

Forums

It is a platform consider as discussion site, a virtual session to exchange opinions and experiences. In comparison to social network, in forums there is no need to personally

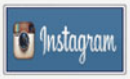
Logo	SNS	Visitors	Per
	Facebook	2,200,000,000	Unique Monthly Visitors
	Instagram	1,100,000,000	Unique Monthly Visitors
	Pinterest	250,000,000	Unique Monthly Visitors
	Snapchat	110,000,000	Unique Monthly Visitors
	LinkedIn	85,000,000	Unique Monthly Visitors

Fig. 4 http://www.bizmba.com (2020)

connection between the members and the content can be read by any people. Figure 5 describe social media types and tools more specifically:

3 Research Methods

3.1 Study Approach

To achieve the objectives of the study and answer its questions, the analytical descriptive approach methodology was adopted as the study has a specific clear problem statement and specific hypotheses (Malhotra, 2004), so it is the most suitable approaches for the nature of the study and its goals in terms of conducting data analysis procedures and subjecting them to the statistical analysis and tests its hypotheses.

	Social media types	Examples of social media tools per type
1	Social communities	Facebook, LinkedIn, Google+, Yammer
2	Social text publishing tools	Blogs, Wikipedia, SlideShare, Quora
3	Microblogging tools	Twitter, Tumblr
4	Social photo publishing tools	Pinterest, Instagram, Flickr, Picasa
5	Social audio publishing tools	Spotify, iTunes, Podcast.com
6	Social video publishing tools	YouTube, Vimeo, Vine
7	Social gaming tools	World of Warcraft
8	Live casting tools	Live365, Justin.tv
9	Virtual worlds	Second Life, Kaneva
10	Mobile tools	Foursquare, Swarm
11	Productivity tools	SurveyMonkey, Google Docs, Doodle
12	Aggregators	MyYahoo!,iGoogle (until November 2013)

Fig. 5 Social media types and tools (Looy, 2016)

3.2 Study Population and Sample

The study adopted visitors of Petra tourism city as a population. It is not targeted to a specific industry like (shopping centers, restaurants or hotels …etc.), so the Convenience sample technique (Accidental sample) was chosen, so it is the most suitable sample technique as the nature of the study and its population. The questionnaire was randomly distributed to the members of sample in 10 days distribution program from 5 to 15 May 2020 simultaneously with governmental lockdown and unstable conditions due to COVID-19 epidemic, so researchers couldn't distribute more than 175 questionnaires. Table 1 describes the characteristics of the sample.

Table 1 Sample demographic characteristics

Sample characteristic			
Total	175	Valid for statistical analysis 148	
Gender		Age	
Male	71	18–29	58
Female	77	30–49	62
		+50	28

3.3 Questionnaire Design Process

A Questionnaire was designed to achieve the objectives of the study, and to answer its questions, as it is instrument to collect data from the sample to test study hypotheses and consists of three parts. The first part of the questionnaire provides a general information to describe the demographic characteristics of the respondents as shows in Table 1. Second one consists of 32 questions to measure the social media usage and the four phases of customer decision making process variables, to test hypotheses of the study, this part relies mainly on (Fotis et al., 2011; Malhotra, 2004; Roučkova, 2015), studies and restructured to correspond the goals and objectives of this study. Whereas, paragraph number 33 which consist of a question and 4 nominal options, to achieve the third objective based on (Fotis et al., 2011) study. A 5-point Likert scale anchored by "strongly disagree" (1) to "strongly disagree" (5) was used as the attitude measurement for the independent and dependent variables. The degree of approval was concluded through the following steps according to Chen and Tabari (2017):

- Extracting the scale range ($5 - 1 = 4$).
- Divide the average scale by the number of required levels, total of 3 (Low, Moderate, and High) $4 \div 3 = 1.33$, which the category length, and thus resulting in three levels:

  1.00–2.33 low level of approval.
  2.34–3.67 Moderate level of approval.
  3.68–5.00 High level of approval.

Whereas, question number 33, which consist of a question and 4 nominal options, tested by calculation of frequencies and percentage.

4 Data Analysis

4.1 Reliability Test

The reliability of a measure indicates the stability and consistency with which the instrument measures the concept and helps to assess the 'goodness' of a measure (Dancey & Reidy, 2004). The reliability of the questionnaire was measured by extracting the Cronbach Alpha coefficient to measure the coefficient of the scale paragraphs' consistency. According to each variable, note that all of them higher than the value of (0.7), which indicates the reliability of the study tool. Table 2 shows the study tool reliability of coefficients.

Table 2 Reliability of the study tool by Cronbach alpha

Variable	Dimension	Number of paragraphs	Coefficient of Cronbach Alpha
Social media	Social media usage	8	0.849
Customer decision-making process	Information search	7	0.884
	Evaluation of alternatives	5	0.889
	Purchase decision	6	0.797
	Post-purchase evaluation	6	0.873

Table 3 Validity of the study by KMO and Bartlett's test

KMO and Bartlett's test		
Kaiser-Meyer-Olkin measure of sampling adequacy		0.673
Bartlett's test of sphericity	Approx. Chi-square	16,753.023
	df	221
	Sig.	0.000

4.2 Validity Test

To verify the validity of the questionnaire items used in the study, it had been presented to academic arbitrators specialized in this field and are working in Jordanian Universities, in order to ensure the accuracy and validity of the paragraphs. To issue out their decision regarding the validity of the paragraphs, the soundness of their formulation and its relevance to the study subject. The questionnaire was assessed by four academic arbitrators specialized in business administration, marketing and strategic management. Furthermore, construct validity was adopted as validity measurement and factor analysis was used to measure the construct validity (Dancey & Reidy, 2004), the details of factor analysis as shows in Table 3 is appropriate because the KMO value is 0.673 is greater than 0.6 and approximate Chi-Square 16,753.023 with df 221 at the significant level 0.000 less than 0.05. Hence factor analysis indicated that it is appropriate for further data analysis.

4.3 Instrument Descriptive Statistics

To achieve the first objective of the study (Explore to what extent Petra city visitors using social media in their purchase decision making process in context of holiday travel planning), Mean and Standard deviations adopted to analysis of the data as shown in Table 4.

Table 4 Descriptive statistics of the study instrument

	Customer decision making-process	Mean	Standard deviation	The level of usage
1	Information search phase	3.05	1.147	Moderate
2	Evaluation of alternatives phase	3.15	1.210	Moderate
3	Purchase decision phase	3.54	1.082	Moderate
4	Post-purchase evaluation phase	3.64	1.093	Moderate

Data from Table 4 shows that, there is a moderate level of using social media among Petra city visitors in all phases of purchase decision-making process in holiday trip decision.

4.4 Hypotheses Test

For this study, five hypotheses were tested using Simple Regression Linear and as following in Table 5:

H1. There is a statistically significant impact of using social media on the customer decision making process in search information phase when choosing destination at the significance level ($\alpha \leq 0.05$).

Table 5 shows that, the result from this table is statistically accepted, where F-value (79.684) and it is statistically significant at the significance level ($\alpha \leq 0.05$), which confirms that, there is statistically significant of the impact of the social media usage on the customer decision making-process in information search phase when choosing destination, and the value of (T) calculated (6.377) statistically significant at the significance level ($\alpha \leq 0.05$). That is indicated by the value of the coefficient (β) (0.625), where the independent variable is interpreted according to the coefficient

Table 5 Regression factor for the study hypotheses

Hypotheses	Regression		(F) Test		(T) Test		R^2	R
	β	Std. error	F	Sig.	T	Sig.		
H1	0.625	0.060	79.684	0.000	6.377	0.000	0.657	0.562
H2	0.485	0.060	45.633	0.000	6.755	0.000	0.438	0.588
H3	0.455	0.060	73.633	0.000	8.071	0.000	0.410	0.640
H4	0.471	0.058	40.927	0.000	6.397	0.000	0.505	0.768

*Statistically significant at ($\alpha \leq 0.05$) level

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of (R^2) estimated by (0.657) of the variance in the dependent variable, which mean (65.7%) of the changes in information search phase when choosing destination, caused by changes in the level of social media usage.

H2. There is a statistically significant impact of using social media on customer decision making process in evaluation of alternatives phase when choosing destination at the significance level ($\alpha \leq 0.05$).

Table 5 shows the results from this table is statistically accepted, where F-value (45.633) and it is statistically significant at the significance level ($\alpha \leq 0.05$), which confirms that, there is statistically significant of the impact of the social media usage on the customer decision making-process in evaluation of alternatives phase when choosing destination, and the value of (T) calculated (6.755) statistically significant at the significance level ($\alpha \leq 0.05$). That is indicated by the value of the coefficient (β) (0.485), where the independent variable is interpreted according to the coefficient of (R^2) estimated by (0.438) of the variance in the dependent variable, which mean (43.8%) of the changes in evaluation of alternatives phase when choosing destination, caused by changes in the level of social media usage.

H3. There is a statistically significant impact of using social media on customer decision making process in purchase decision phase at the significance level ($\alpha \leq 0.05$).

Table 5 shows that, the result from this table statistically accepted, where F-value (73.633) and it is statistically significant at the significance level ($\alpha \leq 0.05$), which confirms that, there is statistically significant of the impact of the social media usage at the customer decision making-process in purchase decision phase, and the value of (T) calculated (8.071) statistically significant at the significance level ($\alpha \leq 0.05$). That is indicated by the value of the coefficient (β) (0.455), where the independent variable is interpreted according to the coefficient of (R^2) estimated by (0.410) of the variance in the dependent variable, which mean (41.0%) of the changes in purchase decision phase, caused by changes in the level of social media usage.

H4. There is a statistically significant impact of using social media on customer decision making process in post-purchase evaluation phase at the significance level ($\alpha \leq 0.05$).

Table 5 shows that, the result from this table statistically accepted, where F-value (40.927) and it is statistically significant at the significance level ($\alpha \leq 0.05$), which confirms that, there is statistically significant of the impact of the social media usage on the customer decision making-process in post-purchase decision phase, and the value of (T) calculated (6.397) statistically significant at the significance level ($\alpha \leq 0.05$). That is indicated by the value of the coefficient (β) (0.471), where the independent variable is interpreted according to the coefficient of (R^2) estimated by (0.505) of the variance in the dependent variable, which mean (50.5%) of the changes in post-purchase decision phase, caused by changes in the level of social media usage.

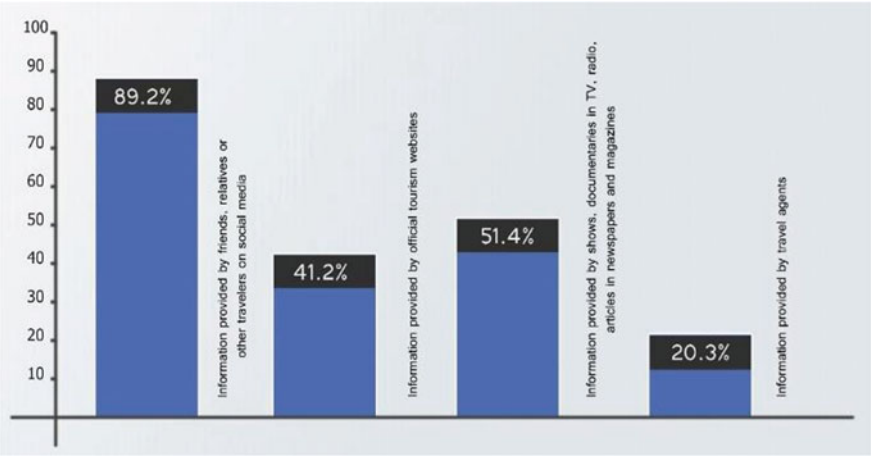

Fig. 6 The level of trust towards information provided by social media

4.5 Objective No. 3

To achieve the third objective of the study (Exploring the level of customer trust towards social media in relation to other sources of holiday related information), frequencies and percentage technique adopted as shows in Fig. 6.

Figure 6 shows that, 89.2 % of the sample trust the information provided by their friends, relatives or other travelers on social media tools in holiday trip decision, 41.2 % trust the information provided by official tourism websites, 51.4 % trust the information provided by shows, documentaries in TV, radio, and articles in newspapers and magazines, whereas the lowest ratio 20.3 % came of the information provided by travel agents. From the data in figure above can notices that, the highest percentage came to the first column on the left where 89.2% of the sample trust the information provided by their friends, relatives or other travelers on social media tools. In contrast to, other sources of information.

5 Discussion

This study found a significant impact of social media usage on customer decision making process in holiday travel planning, which in fact, corresponds with (Fotis, 2015; Fotis et al., 2011; Senanayake & Anise, 2019) studies, where Senanayake found a strong relation between social media usage and travel decision making process, a strong relation between travel decision making process and travel motives throughout social media usage. Notices that, this study focused at the customer decision making in context holiday travel planning, whereas Senanayake focused at the travel decision making process. This study studied the impact of variable on another one, whereas

Senanayake studied the relation between variables. (Fotis et al., 2011) investigate the role of social media in holiday travel planning, whereas this study investigates the impact of social media usage on customer decision making process in the context of holiday travel planning as a new study model. On another side, (Vinerean, 2017) study found "the most trustworthy: friend and family information on social media, whereas least trustworthy, information provided by companies and official websites", and "Positive influence; no strong influence to select, whereas, Positive influence; strong influence to exclude from choice", and (Dwityas & Briandana, 2017) found "The customers consider that the User Created Content becomes more trusted content if compared to that from marketers or companies", which correspond with the results of this study, where this study found " the highest rate of the customers trust in information sources were to the information provided by friends, relatives and other travelers on social media with ratio 89.2%", and the lowest percentage to information provided by travel agents with 20.3".

Furthermore, based on the respondents' answers, researcher noticed that, all of the paragraphs those talked about Advertisements on the social media in all dimensions of the study came with low-to-med level. First dimension Social Media Usage, paragraph (4) came with (2.80), which states "I browse the Ads that related to tourism services". In Information Search Phase, paragraph (3) came with (2.84), which states "The adverts on social media are important when you want to try a new place", and paragraph no (4) came with (2.77), which states "Ads published on social media are important when choosing a destination". In Purchase Decision Phase, paragraph (5) came with (2.70), which states "Ads on social media during my holiday is stimulates me to trying a new products/services". On the other side, in the results of the fourth objective, noticed that the lowest ratio of trust in information sources came to information provided by Travel Agent with ratio 20.3%, where this results in corresponding with founds of Fotis et al. (2011) "study found that information from other travelers in various websites is trusted more than official tourism websites, and travel agents". Therefore, could conclude that, there is a relation between decreasing the level of trust in travel agent's information and the decreasing the level of browsing tourism services adverts by customers.

6 Conclusion

6.1 Implications

In the light of this study, as it is discussed the impact of social media on customer decision making process in context of holiday travel planning, and proved in scientific methods that, there is a great effect of the social media on the customer decision process, and how it could be the success key for the companies engaged in tourism industry. Therefore, study recommends those engaged of such industry by the following recommendations:

- The companies and agents engaged in tourism industry to analyze current marketing strategies and development it to adapt this technology due to its great advantages.
- Design and develop a new training programs to improve the employee's skills to obtain the maximum benefits of this marketing strategies.
- Study showed an important information to those work in hospitality industry, when the paragraph "I use social media when seeking ideas and information on accommodation options)" came with level (3.36), which provide an opportunity for hotels to have a strong advantage of social media.
- A recommendation to a public sector, the lowest paragraph between the all, states that "The information and Ads published about Petra city on social media was the reason to choose it as a destination" came with lowest level (2.26) among all paragraphs, which drew attention to improve the marketing strategies through the social media.
- After the end of the COVID-19 pandemic, companies operating in the field of tourism are in dire need of promotional and advertising campaigns in line with the modern technologies, so they could take social media tools in consideration as marketing strategy.

6.2 Limitations and Future Recommendations

This research process provides some insights to the researchers, and these insights could be viewed in the shed light of limitations. This study, showed the impact of social media usage on customer-decision making process in all phases except the first one (problem recognition phase). Future studies to be done on the whole series. Also, this study adopted the quantitative research approach and questionnaire study tool. Future study could combine the two approaches quantitative and qualitative, and interview study tool and could adopt e-questionnaire to increase the number of respondents. Furthermore, this study, applied in tourism sector among the Petra city visitors. Future study could apply in another sector and exploring what is the impact of social media on customer decision making process in another industry field.

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Factors Influencing Online Shopping During Fear of Covid-19 Pandemic in Jordan: A Conceptual Framework

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Abstract Aside from causing fear worldwide, COVID-19 has significantly affected global marketing and the behavior and attitudes of consumer. In Jordan, COVID-19 has affected the lifestyle, buying, and consumption patterns of consumer whereby in-store purchases are becoming less popular, and consumers are increasingly favoring other product sources. With the increasing usability of the internet in the business world, the popularity of online shopping is increasing, evidenced by the increased number of online retailers globally. A psychometric Fear of COVID-19 Scale (FCV-19S) was developed to evaluate COVID-19 fear and online shopping and it was employed to gauge consumers in developing countries like Jordan. This descriptive study presented a theoretical framework comprising trust issues, perceived ease of use, perceived risk and fear of complexity in online shopping among Jordanian consumers. The findings show that trust, perceived ease of use, fear of COVID-19 and perceived risk affect online shopping behavior. The increase in confidence in a given online site increases the frequency of online shopping, and the decrease in the risk perceived increases the decision to make an online purchase.

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_16

Keywords Perceive risk · Trust · Ease of use · Fear of Covid-19 · Online shopping behavior

1 Introduction

The novel coronavirus 2019 (COVID-19) is a deadly infectious disease that has shaken the world and managing this disease has been highly challenging. Symptoms of this disease usually would appear within 2–14 days, and among them are fatigue, fever, dry cough, dyspnea and myalgia (Wang et al., 2020). In China, the mortality rate of this disease was reported at 3.6% as of March 1, 2020, and the rate reported for other nation was 1.5% (Baud et al., 2020). By March 14, 2020, a total of 135 countries/territories had reported confirmed cases of COVID-19 (World Health Organisation (World Health Organization, 2020). COVID-19 is highly infectious and very deadly, and this has caused fear among people. Lin (2020) reported that COVID-19 patients are feared and this fear may indeed exacerbate the harm caused by the disease. Also, there has been worldwide fear towards COVID-19, resulting in stigma in certain situations (Alsyouf et al., 2021; Centers for Disease Control & Prevention, 2022; Guan et al., 2019; Huang et al., 2020; Lin, 2020; Lin et al., 2021).

Infectious disease often generates fear, as opposed to non-infectious ones, and this fear has direct linkage to its rate of transmission, the medium of infection, and its morbidity and mortality rate as well. Hence, the more rapid and the more undiscernible the disease is, the more fearful the disease becomes. Fear could result in psychosocial problems for instance, loss, discrimination, and stigmatization as well (Pappas et al., 2009). Extreme fear could impair rational thinking of individuals towards COVID-19. In combatting this disease, countries all over the world are currently focusing on control of infection, effective vaccine, and treatment cure rate (Abuhashesh et al., 2021; Almajali et al., 2021; Almajali, 2021a, b; Wang et al., 2020). However, in achieving a COVID-19-free society, the psychosocial aspect has to be taken into account as well as the social media impacts (Al Khasawneh et al., 2021a, b; Al-Dmour et al., 2020, 2022).

In Jordan, the impact of COVID-19 was rather late, but the severity was just as high especially on the country's economics and health, and globalization has contributed to Jordan falling victim of the pandemic. Several measures have been implemented by Jordan like social distancing, lockdowns, movement restrictions, as well as closure of some businesses, particularly those classed as non-essential. Relevant to that, the pandemic has drastically changed the way consumers in Jordan live their life and make purchases of goods and services. Like other consumers globally, those in Jordan had to search for other ways in their product purchase affairs due to restrictions of in-store purchases involving both essential and non-essential product retailers. Furthermore, because of the pandemic, many consumers in Jordan had to deal with the new personal and social situations, and many were facing changes in their income and leisure time. All the aforementioned have impact on their attitudes and behaviors as consumer.

New personal circumstances like different income level, different lifestyle (from free moving to home bound), different leisure time (from more time at work to more time at home, or full time homebound) have led to the change in values and priorities of consumers. Among the changes caused by the pandemic include less purchases on non-essential items like clothing, jewelries, accessories and transports (just to name a few) which has led to a plummet in the sales of the aforementioned items. In fact, the pandemic has severely hit the fashion and the apparel industry. The impact of the pandemic on the economy was severe, and many consumers were uncertain about their future financial situations.

In addition to reducing their purchases on non-essential items, consumers also have learned to make purchases online, on various items. Online purchasing saves consumer from having to visit the physical store which can put them at risk of catching the coronavirus from other infected individuals. The ease of online purchases has reduced their desire to visit the physical stores. However, there are issues associated with online shopping. In a study conducted by Almajali and Hammouri (2021), the authors found that online shopping stores are facing several issues namely trust, perceived risk, and perceived ease of use. The authors further mentioned that trust in the online store will decrease the perceived risk, resulting in the execution of online purchase. In Jordan, there has been an increase in online purchasing and such increase has been associated with the increasing number of online stores available in social media. It is clear that people in Jordan are interested in making purchases online.

In this study, the ineffectiveness of in-store purchases during COVID-19 pandemic and fear towards COVID-19 are discussed. The decisions of retail brands to sell their products online to provide convenience to their target customers are explored. The resultant new lifestyle of consumer from of the pandemic is elaborated, particularly in respect to online shopping.

2 Literature Review

Online shopping can be performed anywhere, so long that there is internet access. People engage in online shopping because it offers better convenience, selection, information, and price. In exploring the subject of online shopping in the context of Jordan, Theory of Planned Behavior by Ajzen (1991) and Technology Acceptance Model (TAM) by Davis (1989) were the two theoretical adoption models applied in this study. Both theories have been used in evaluating the readiness of people in utilizing technology (Almajali et al., 2021; Manaseer et al., 2019; Hsu et al., 2006; Wu & Chen, 2005; Gefen et al., 2003).

TAM has been altered in various studies to increase its fittingness to the study context (Venkatesh & Davis, 2000). In this study, TPB was examined strength-wise to increase the potency of TAM, specifically through the inclusion of external independent variables with significant effect on technology adoption decision-making

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process of consumer. TAM does not consider the impact of social and interpersonal variables on the decisions to adopt technology (Ukoha et al., 2011), and thus, through TPB, the constructs of perceived behavioral control and subjective norms were added to TAM. Both constructs describe the ease or difficulty in performing certain act amidst resource constraints, and as reported by Orapin (2009), both factors impact consumers in their online shopping.

In their study, Nachit and Belhcen (2020) reported that COVID-19 pandemic has dramatically altered the behavior of consumer in Morocco. According to the authors, the priorities of Moroccan consumers have shifted because of the pandemic. This was demonstrated by their high concerns towards the availability of some essential products in the market like the hygiene products as evidenced by panic buying of these products. The pandemic has indeed increased the willingness of Moroccans in spending more on hygiene and food items. Additionally, external information, alternative attractiveness, conformity, regret, and loyalty were reported by Liao et al. (2017) as the factors impacting online shoppers. In their study on digital transformation readiness of consumers in Jordan, Nachit and Belhcen (2020) found the impact of COVID-19 and government measures, on knowledge, attitude, and perception on digital transformation of public and private sector. Furthermore, certain digital tools were introduced, in order that consumers were able sufficiently access their sought-after products and services.

As described by Moling (2011), online shopping is a process of direct goods and services purchase made by customers from a seller over the internet with no intermediary service present. Internet shopping allows customers to review the goods and services that they want to purchase with ease. This type of shopping does not involve or require face-to-face communication between seller and consumer. In terms of trust in online shopping, it is considered as a long-term investment, and in this type of shopping, trust cannot be controlled, it can only be supported. Hence, trust must be earned. For many people, online shopping is challenging because it is a fairly new form of shopping and many people are not acclimatized to it (Monsuwé et al., 2004).

Kumar and Grisaffe (2004) mentioned Perceived Risk as an important element in buying behavior. Gefen et al., (2002) described perceived risk as an attribute of an alternate decision that reflects the difference of its potential outcomes. Perceived risk affects purchase decisions, especially when the outcomes of the purchase are unknown. Hong and Yi (2012) found that consumers who favor Internet transactions over the conventional ones appear to have low risk avoidance profiles. Hence, alternating, postponing and canceling a purchase demonstrate risk concerns.

Perceived ease of use relates to the level to which a person is sure that the use of certain technology will be easy (Almajali & Masa'deh, 2021; Venkatesh & Davis, 2000). The present study hence will examine the effect of perceived ease of use on the use of various online stores. Also, it was discovered that COVID-19 pandemic and restrictions imposed by government have affected consumer behavior. Armando, (2021) indicated that during the pandemic, consumers, irrespective of generation, are all into making purchases of goods and services online. In fact, a significant swing towards e-commerce spending in addition to the increase of shopping frequency, have been reported by Armando (2021). In examining online consumer behavior during

COVID-19 pandemic, Barbu et al., (2021) identified several factors that propel online consumer behavior. These factors are: strong and unremitting increase in the amount of Internet users, increased knowledge towards online shopping, increase in the number of online products being introduced, and low prices of products purchased in bulk. The pandemic itself, and the requirements of social distancing and staying at home are other factors contributing to the increase in online shopping activities.

The study at hand is of value to both scholars and retail marketers in increasing their knowledge on the perceptions of online shopping intentions of consumer during COVID-19 health safety crisis and also in managing COVID-19 fears. Based on the findings, appropriate marketing strategies could be developed in encouraging online shopping among consumers in Jordan particularly.

3 Research Model and Hypotheses Formulation

Based on the above discussion on online shopping behavior among consumers in Jordan, the hypotheses proposed in this study are, as seen in Fig. 1, as follows.

H1 Perceived risk will have a positive impact on online shopping behavior.
H2 Trust will have a positive impact on online shopping behavior.
H3 Perceived ease of use will have a positive impact on online shopping behavior.
H4 Fear of COVID-19 will have a positive impact on online shopping behavior.

The measurement items in this study were adapted from past related studies. Details on them are as presented in Table 1.

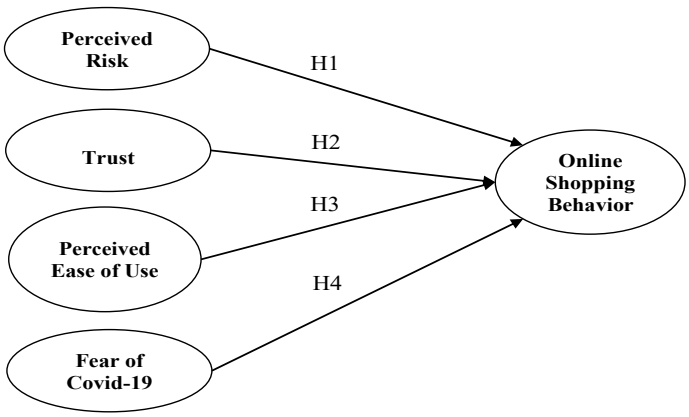

Fig. 1 The proposed model

Table 1 Measurements of factors

Factor	Code	Measurement dimensions of factors
Online purchasing behavior (Forsythe et al., 2006; George, 2004; Swinyard & Smith, 2003)	OPB1	It is easy to use the Internet when I shop online
	OPB2	The opinion of my family and friends is important when I make a purchase online
	OPB3	I think I will face no problems with online shopping if my family and friends also face no problems with online shopping
	OPB4	I will not shop online if the webpage is slow to download
Perceived risk (Miyazaki & Fernandez, 2000)	PR1	I think that online shopping today is less risky
	PR2	I think that online shopping today is safe
Trust (Miyazaki & Fernandez, 2000)	TR1	I am confident about buying products or services online
	TR2	I am anxious about buying products or services online
	TR3	Online shopping today is reliable
Perceived ease of use (Davis, 1989)	PEOU1	I think that learning the technology would not be easy for me
	PEOU2	I think that online shopping does not need much thinking
	PEOU3	I think that using technology in doing my online shopping tasks is easy
	PEOU4	I think that online shopping technology offers flexible interaction
	PEOU5	I can easily become expert in online shopping technology
	PEOU6	Online shopping technology will seem easy to use to me
Fear of COVID-19 (Lin et al., 2021)	FCV1	I am really afraid of Coronavirus-19 (COVID-19)
	FCV2	It is distressing to think about Coronavirus-19 (COVID-19)
	FCV3	Coronavirus-19 (COVID-19) really bothers me
	FCV4	I think Coronavirus-19 (COVID-19) nearly always causes death
	FCV5	Coronavirus-19 (COVID-19) is an unstable disease
	FCV6	The thought of Coronavirus-19 (COVID-19) makes my hands clammy

(continued)

Table 1 (continued)

Factor	Code	Measurement dimensions of factors
	FCV7	Dying from Coronavirus-19 (COVID-19) frightens me
	FCV8	I feel anxious when watching news and stories about Coronavirus-19 (COVID-19) on social media
	FCV9	The thought of Coronavirus-19 (COVID-19) makes me unable to sleep
	FCV10	The thought of being infected by Coronavirus-19 (COVID-19) gives me heart palpitations

4 Population and Sample Size

The population of this study comprised online shoppers in Jordan, and the participants selected in this study were recommended by informants or the study participants themselves. The recommended participants were those with the potential interest in taking part in the study through social networks. All participants were those who prefer to shop online.

5 Discussion and Conclusion

Trust refers to the readiness of customer in accepting flaws in an online transaction as a compensation for desirable anticipations in future online store behavior (Kimery & McCard, 2002). Online shopping can only occur when there is trust because shoppers or consumers will be trading with unknown parties, in this case, sellers. In terms of payment, it may be required prior to or after the product or service is delivered. If the payment is made before the product or service is received, then, the consumer would be transferring money without assurance if the seller will actually send the product or service. In order to reduce uncertainty and build trust, good communication between seller and consumer is important. Additionally, the provision of a detailed product description will increase the confidence of consumer in making the purchase of products or services online.

Online shopping is also affected by Perceived Risk which comes in two types according to Park and John (2010). The first type of perceived risk is behavioral risk, and this risk comes from online retailers that employ internet marketing techniques in monitor all transactions. The associated risks are psychological risks and product risks (i.e., time and convenience risks). Another risk is the environmental risk created by the internet, and this risk cannot be controlled by both the retailer and consumer. This could lead to financial and security risks. In general, respondents understand the risk associated with online purchasing. In order to reduce the associated risk,

respondents will evaluate the site, and examine the products of interest, in all matters like price, deals, reviews, just to name a few.

Perceived ease of use is another factor affecting online shopping behavior. It relates to the perception of user concerning the difficulty of technology usage. In other words, perceived ease of use concerns the level of ease of using a given technology (Davis, 1989). A system that is viewed as complicated will not be used when alternative method which is perceived as easier to use, is available. In the context of online shopping, technologies that are difficult to utilize are considered as less useful. Also, uncertain consumer demand and supply chain issues could impact COVID-19 fear. As this coronavirus is a pandemic, many merchants have been affected. Filimonau et al., (2021) and Alshurideh et al., (2021) indicated that during the pandemic, these merchants were facing reduction in sales, disrupted supply chain, and increase in the purchases of certain products, especially hygiene related products.

Online shopping is greatly impacted by trust and perceived risk, and consumers will likely engage in online shopping if they are confident towards the online site. Perceived lower risk also increases the likelihood of online purchasing. Ease-of-use quality in online purchasing site entices consumers to make the purchase online as well. Additionally, an evaluation instrument of COVID-19 fear during pandemic needs further scrutiny, in order to be validated. To date, at least ten countries have verified the satisfactory psychometric properties of the instrument. Moreover, the relationship between variables, and the validated hypotheses have to be examined more deeply.

Consumers need assurance of security from online stores in order that they could stay loyal to the stores. Also, assurance of security will solidify the trust of consumer, while reducing the possibility of fraud. In increasing trust and hence online purchasing, online stores should provide details of items offered so that consumer could make accurate purchasing decisions, use established and trusted delivery service in order that the product purchased could reach the consumer safely and on time and provide fair and appropriate treaty agreements in order that the consumer will feel satisfied and will make repeat purchase or even promote the store to other potential consumers.

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Learning- E-learning and M-learning

Agility in Higher Education Institutions to Management of Covid-19 Disaster in UAE

Mohammed T. Nuseir, Amer Qasim, and Ghaleb A. El Refae

Abstract The covid-19 pandemic has severely affected the economy all around the globe and also dramatic effects on the education sector worldwide. This situation needs to be examined and capture the attention of recent studies and regulators. Thus, the present study aim is to examine the impact of student readiness, faculty readiness, and information technology readiness on the management of the Covid-19 disaster in higher education institutions in UAE. This article has followed the quantitative approach of data collection and taken the questionnaires for this purpose. The current study has executed the smart-PLS to analyze the nexus among the constructs. The results indicated that student readiness, faculty readiness, and information technology readiness have a positive linkage with the management of the Covid-19 disaster in higher education institutions in the UAE. This study has guided the policymakers that they should enhance their focus towards the management of the Covid-19 disaster in the education sector and develop effective policies that improve the education sector's ability to manage the effects of the Covid-19 disaster.

Keywords Covid-19 disaster · Student readiness · Faculty readiness · Information technology readiness

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_17

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1 Introduction

The covid-19 pandemic is a contagious disease caused by severe acute respiratory syndrome coronavirus 2. First, it started in Wuhan, China, in December 2019. The disease has spread across the world, leading to an ongoing pandemic. Covid-19 transfers from one person to another when people are exposed to a virus which consists of respiratory droplets and airborne particles exhaled by an infected person. These particles are inhaled or reach the eyes, nose, or mouth of an individual through touching or being coughed on (Akour et al., 2021; Al-Dmour et al., 2021a; Alshurideh et al., 2021a; Daniel, 2020; Liguori & Winkler, 2020). The risk of covid-19 is high in crowded or poorly ventilated places. That is the reason the covid-19 epidemic has affected the educational system around the world (Al Khasawneh et al., 2021a; Alameeri et al., 2021; Al-Dmour et al., 2021b; Aljumah et al., 2021a; Amarneh et al., 2021). It causes the near-total closure of educational institutions (Ahmad et al., 2021; Al Khasawneh et al., 2021b; Alshurideh et al., 2021b; Shah et al., 2021). Most of the governments made the decision to close educational institutions in a struggle to reduce the spread of covid-19. As per the worldwide statistics of 2021, about 825 million learners are currently influenced by the closure of educational institutions as a result of the pandemic. As per UNICEF monitoring, 23 countries are presently imposing nationwide closures, and about 40 countries are found to be imposing local closure. This all affects about 47% of the world's student population. While at the beginning of this contagious disease, more countries were forced to close educational institutions (Alshamsi et al., 2021; Alsharari & Alshurideh, 2020; Chang et al., 2021; Leo et al., 2021; Salloum et al., 1153).

As education has become one of the basic needs of life and also an economic plateform which provides the nation builders, great producers, and businessmen, even in this severe situation it has been given special attention. The educational institutions have been trying their best to manage the issues arising from the universal contagious disease covid-19 (Al-Hamad et al., 2021; Alshurideh et al., 2019a; Kurdi et al., 2020a). The institutions have been applying the maximum possible ways to provide education to students and maintain continuity in education. Thus, the online classes are being carried on (Al Kurdi et al., 2020a; Alshurideh et al., 2019b; Theoret & Ming, 2020). Our study analyzes the agility in the higher educational institutions and examines how they help in overcoming the covid-19 disaster. Some educational institutions, especially higher educational institutions, maintains the quality of the resources, technology, techniques, teaching methods, human resources, and the production of talented students as they can respond to the sudden changes in the circumstances (Alshurideh, 2014; Alshurideh & Xiao, 2012; Alshurideh et al., 2019c). During covid-19, the educational institutions are forced to close traditional face-to-face classes; their agility in all the organizational processes enables them to continue the teaching classes online. The agility in educational institutions is derived by information technology readiness, the readiness of faculty at education institutions online teaching classes, and the student's readiness for attending online learning classes (Alomari et al., 2019; Chick et al., 2020; Elshamy et al., 2017).

This study analyzes the impacts of agility in higher educational institutions on the management of the covid-19 disaster in the United Arab Emirates (UAE). UAE has been declared by the reports of certain local and international organizations in 2014 as one of the most developed regions of the world. According to the reports, UAE lies among happy countries. Here, the citizens and other residents are happy having a high living standard. Most of the economic fields like investment, information, technology, industry, and service industry have high growth. Thus, UAE is a successful economic world. UAE has a good education system that produces skilled persons. UAE is regarded as one of the top 20 best education systems across the world (Ashour, 2020). Though UAE is a wealthiest country and has a successful education system throughout the world, it is not safe from the covid-19 pandemic. This universal contagious disease has affected the higher education institutions in UAE. UAE universities are moving typical face-to-face education to remove or distance education. Most educational institutions are moving towards online education. Students are acquiring education online having seated in front of their computer screens at their homes (AlHamad & Al Qawasmi, 2014; AlHamad et al., 2012; McMinn et al., 2020). The education sector in UAE growing rapidly and shows that both public and private enrolment will grow around 0.7%, resulting in more than 5,500 extra enrolments by 2021. These figures are shown in Fig. 1.

Our study aims at encouraging online education in higher educational institutions of UAE in case all the higher educational institutions, including universities, are bound to close while covid-19, the universal contagious disease, is spreading. This study elaborates how with the agility in higher education institutions in the form of information technology readiness, faculty readiness, and students' readiness, online education can be promoted, and thus, covid-19 disaster in higher educational institutions can be overcome. This study has chosen UAE as a center of analysis in this context because it can provide more valid consequences of the agility in higher education institutions and their role in overcoming the covid-19 disaster. UAE consists of seven emirates Abu Dhabi, Ajman, Dubai, Fujairah, Ras Al Khaimah, Sharjah,

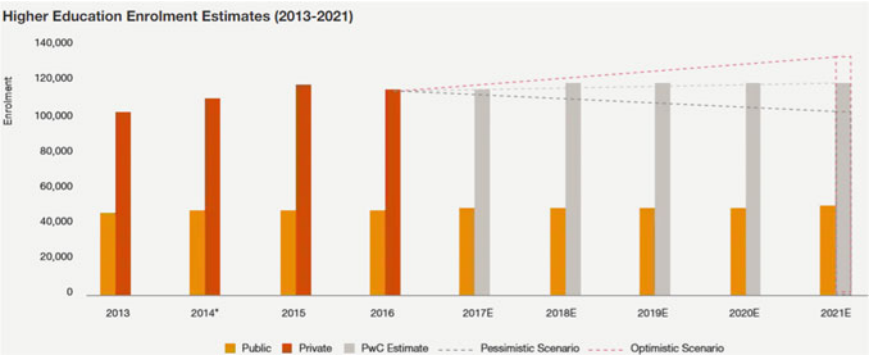

Fig. 1 Higher education enrollment in UAE

and Umm Al Quwain. And UAE education system is one of the top 20 education systems across the world (Alhashmi & Moussa-Inaty, 2021). Thus, the study conducted in UAE would be more general as compared to any study dealing with the aforementioned concept in any particular country.

The aim of our study is to examine the agility in higher educational institutions and check their influences on the management of the covid-19 pandemic. In this context, it examines information technology readiness, the readiness of faculty at education institutions' online teaching classes, and the student's readiness for attending online learning classes. From the beginning of 2021 till now, many authors have given attention to the impacts of covid-19 disasters on education and the factors helping in overcoming the covid-19 disaster. These authors have discussed the efforts of institutional management as a whole while analyzing the management of the covid-19 disaster, or they have discussed the role of information technology readiness, the readiness of faculty at education institutions online teaching classes, and the student's readiness for attending online learning classes separately. This study secures a distinctive place in the literature as it initiates to categorize the agility in higher education institutions into information technology readiness, faculty readiness, and students' readiness and discuss them separately in detail in relation to the management of covid-19 disaster.

2 Literature Review

The spread of the covid-19 pandemic has been a serious threat to the health of people, as it fast spreads among the people through touching and reaching the virus to the nose, eyes, or mouth when the affected shared something either knowingly or unknowingly or coughs (Akour et al., 2020; AlHamad & AlHammadi, 2018; Qasim AlHamad et al., 2014). It is more likely to affect the health of the people in some places where the people are in close contact with one another or in some crowded place places where people cannot be safe from viruses exhaled from some affected persons. This severe virus not only affects health but has also become a threat to social and economic activities. Thus, the educational sector is also not safe from this prolonged and fatal disease, as the education institutions are crowded places where the public are more likely to interact with one another (Aljumah et al., 2021b, c; Batubara, 2021). The covid-19 has forced the government to close the educational institutions. Still, the management of educational institutions can manage the covid-19 disaster by effectively dealing with the adverse impacts of covid-19 disaster on education through the beginning of online education classes. An educational institution having information technology readiness, the readiness of faculty, and the student's readiness for online classes can better cope with the educational effects of covid-19 (Alshurideh, 2017; Alshurideh et al., 2020a; Rose, 2020). This agility of educational institutions has been addressed by many scholars in their literary workouts. Many of these studies have been cited below.

Information technology is the utilization of computing hardware, application software, storage devices, networking (internet and digital devices), and other devices,

infrastructure, and processes to acquire, process, store, save and transfer information (Aissani & Awad ElRefae, 2021; AlShurideh et al., 2019; Sun et al., 2021). Information technology readiness in an educational institution refers to the availability of good quality computer hardware components, required software applications, storage devices, effective networking systems, smart devices, and infrastructure to respond to the changes in circumstances (Nawaz et al., 2021; Nuseir et al., 2021a, b). Informational technology readiness enables the organization to manage the contagious disease covid-19 as it helps to mitigate the adverse influences of a covid-19 pandemic on the continuity of education through the start of online teaching classes. A study conducted by He et al. (2021) on the management of covid-19 disaster elaborates that the educational institutions which have an effective information technology system consisting of all the essential devices, good quality infrastructure, and fast & smooth internet have the ability to proceed to begin online classes (Al Kurdi et al., 2020b; Alshurideh et al., 2020b; Kurdi et al., 2020b). This study elaborates that it is the ready information system that enables the institution to collect essential information about the provision of online study, keep in contact with the student even after the close of traditional face-to-face classes, and make them go through the course of study online, and prepare them for final exams. Though the covid-19 pandemic places a barrier around the educational institutions in the form of closure of face-to-face educational services, the information technology readiness brings continuity in the education. Similarly, the literary workout of Sittig and Singh (2020) also supports this view by telling that the renowned higher education institutions manage to maintain the quality of all the components of information technology in order to immediately respond to the change in circumstances, have been analyzed to start online teaching classes and overcome the disastrous impacts of covid-19 on the education. The online classes require the computer or other digital devices run on android, speaker, camera, specific apps to start a conversation with the students and to design and show effective presentations, and good quality infrastructure to deliver lecture without any barrier or difficulty. All this is possible under the availability and maintenance of good quality information technology, and fluent online classes are a powerful tool to handle the covid-19 disaster (Her, 2020; Nuseir et al., 2021c; Sultan et al., 2021).

H1: Information technology readiness has a positive association with the management of covid-19 disaster.

The survival, performance, and success of any educational institution depend on the abilities, skills, and responsiveness of the teaching staff. It is the member's staff with the help of which an education institution faces different problems and overcome difficulties. When any disaster comes and disturbs the education system, it is the teachers who come to the ground and fight against the disaster and saves the education. When the Covid-19 the contagious disease which affects the health of people without any discrimination of creed, religion, or region, social or economic group, somehow come into existence, the skilled teachers have shown active performance in maintaining continuity in the education (Bettayeb et al., 2020; Rafique et al., 2021; Taryam et al., 2020). The more effective way to cope with the disastrous

influences of a covid-19 pandemic on education is to keep online contact with the students and provide them online education. The provision of online education is dependent on the readiness of students to take online classes. The study by Moralista and Oducado (2020) has investigated the covid-19 disastrous effects on education and their management to save the education. This study posits that though the spreading of the covid-19 pandemic is a barrier to the way education, if the faculty at the institutions have the willingness to provide online education, is interested in the online classes, motivation to provide education to the students to the best of their abilities, they can continue the education. Similarly, the faculty who have the capacity to create interest and motivation in the students to get online education and perform effectively is a powerful tool against the covid-19 disaster whose victim is not only the health but also the education. The research conducted by the renowned scholar elaborates that when the students have prior knowledge of online education, the essentials of online classes, the ability to design online course study and make them implemented, and the self-efficacy to deal with the students online, it is more likely for the educational institutions to carry online classes and overcome the issue of closure of education institutions created by the spread of covid-19 (Al-Maroof et al., 2021a; Alshurideh et al., 2021c; Elsaadani, 2020). Hence, it can be hypothesized.

H2: Faculty readiness for the online teaching classes has a positive association with the management of the covid-19 pandemic.

When any sort of disaster attacks education, it is the ability and capacity of students to be steadfast and ready to fight against the problems and issues to which they are exposed because of disaster. When the covid-19 attacked the health of the people across the world, it became a serious threat to the people to lose their health or life and thereby, has caused the closure the educational institutions; the students can fight against the disaster and carry their study through online learning classes. But these online classes and their success depend on the readiness of students (Pokhrel & Chhetri, 2021). The students are ready for the online classes when they have sufficient knowledge of digital devices, relevant software apps, and other related devices, the ability to use these devices and apps, have these facilities in actuality, understand the subject being discussed, and respond to this effectively determine the possibility and effectiveness of online classes and the ability of educational institutions to manage covid-19 disaster (Leo et al., 2021). The students have complete knowledge about digital devices like computer or smart mobile devices, speaker or camera, monitor with a large and clear screen, apps to build a virtual conversation with the tutor, and to note down the key points discussed in the ongoing online class, and to respond to them in an effective manner can participate in the online classes. Contrary to this, a student having no knowledge or support in this regard is unable to benefit from online classes and overcome the covid-19 disaster. In case the spreading of covid-19 pandemic, only those students continue their study fighting against the covid-19 disaster who have interest in the online education, knowledge, experience, and financial resources which are helpful in getting an online education (AlHamad et al., 2021; Al-Maroof et al., 2021b; Baticulon et al., 2021).

H3: Student readiness for the online learning classes has a positive association with the management of the covid-19 disaster.

3 Research Methods

The methodology used in this study required direct information from students. Therefore, a data collection instrument was designed to examine the impact of student readiness, faculty readiness, and information technology readiness on managing the Covid-19 disaster in higher education institutions in the UAE. The quantitative approach of data collection designed a questionnaire for this purpose. primary data were collected based on a survey of students at two public universities–United Arab Emirates University and Zayed University, as well as one private university-Al Ain University.

The respondents that are selected based on simple random sampling. Approximately, 400 students are enrolled in the last semester of each institution in business administration departments. Thus, the total population of the study is 1200 students. The researchers have used online forms to distribute the surveys to the respondents and a total of 455 surveys have been forwarded to the respondents, and after twenty days, only 292 were received which about 64.18 percent response rate.

The current study has executed the smart-PLS to analyze the nexus among the constructs. The researchers have used this effective tool due to the large sample size along with the hypotheses testing purpose of the research (Hair et al., 2017). This research has used three predictors such as student readiness (SR) with fifteen items taken from the study of Dray et al. (2011), faculty readiness (FR) with six items that are taken from the study of Petko et al. (2018) and information technology readiness (ITR) with eight items extracted from the article of Blayone et al. (2020). This study has also taken the management of the Covid-19 disaster (MCD) with five items that are taken from the article of Martono et al. (2019). These constructs are given in Fig. 2.

4 Findings

This study has examined the assessment of the measurement model by using the convergent validity that is about the links among items. The statistics have been shown that the factor loadings and AVE are larger than 0.50 while Alpha and composite reliability (CR) values are cross the limits of 0.70. These figures indicated the high linkage among items. These values are shown in Table 1.

This study has examined the discriminant validity that is about the links among variables. The statistics about Heterotrait Monotrait (HTMT) ratios have not larger than 0.85. These figures indicated the low linkage among variables. These values are shown in Table 2 (Fig. 3).

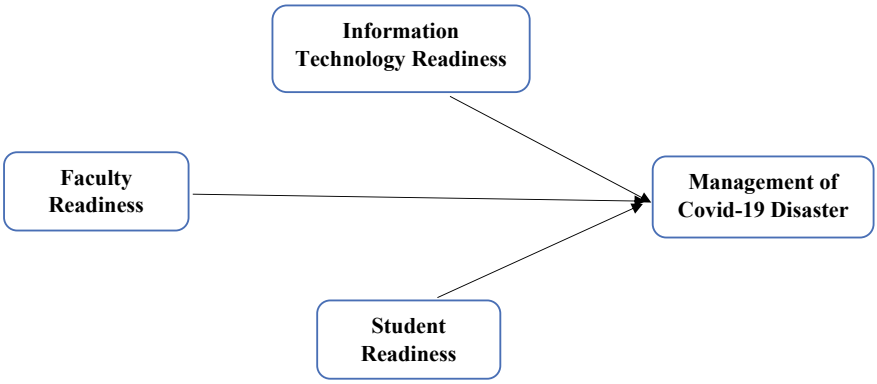

Fig. 2 Theoretical model

The structural model assessment has been shown the nexus among the constructs, and the results indicated that student readiness, faculty readiness, and information technology readiness have a positive linkage with the management of the Covid-19 disaster in higher education institutions in UAE and accept H1 H2 and H3. The results among the variables are significant because the t-statistics are larger than 1.64. These links have been mentioned in Table 3 (Fig. 4).

5 Discussions and Implications

The study results have indicated that the readiness of information technology in an educational institution has a positive relationship with the management of the covid-19 pandemic. The study implies that when the education institution has an effective information technology system encompassing computers (hardware & software), storage, networking, physical devices, infrastructure, and processes to create, process, store, save and exchange knowledge and information, it is in a better position to cope with the disasters of a covid-19 pandemic on education. These results are in line with the recent study of Whitelaw et al. (2020), which has been conducted to check the effects of a covid-19 pandemic on students' education and the performance of the educational institution and examines the management of disaster of covid-19 in this regard. This study suggests that the educational institutions which have the information technology which already has the capacity to meet the online education requirements in case the institutions are not allowed to provide education through physical interaction with the students can mitigate the effects of covid-19 on education. These results are also in line with the previous study of Urbaczewski and Lee (2020).

This study elaborates those good educational institutions, whether they provide school education or higher education (colleges or universities), always take care of

Table 1 Convergent validity

Constructs	Items	Loadings	Alpha	CR	AVE
Faculty readiness	FR1	0.845	0.927	0.943	0.733
	FR2	0.868			
	FR3	0.859			
	FR4	0.821			
	FR5	0.884			
	FR6	0.858			
Information technology readiness	ITR1	0.773	0.906	0.922	0.597
	ITR2	0.752			
	ITR3	0.823			
	ITR4	0.762			
	ITR5	0.723			
	ITR6	0.728			
	ITR7	0.794			
	ITR8	0.820			
Management of Covid-19 disaster	MCD1	0.654	0.848	0.892	0.625
	MCD2	0.782			
	MCD3	0.882			
	MCD4	0.730			
	MCD5	0.881			
Student readiness	SR1	0.842	0.961	0.965	0.647
	SR10	0.826			
	SR11	0.771			
	SR12	0.840			
	SR13	0.821			
	SR14	0.821			
	SR15	0.722			
	SR2	0.820			
	SR3	0.853			
	SR4	0.840			
	SR5	0.842			
	SR6	0.823			
	SR7	0.721			
	SR8	0.764			
	SR9	0.742			

Table 2 Discriminant validity

	FCPA	FR	ITR	SR
FCPA				
FR	0.107			
ITR	0.411	0.155		
SR	0.473	0.076	0.536	

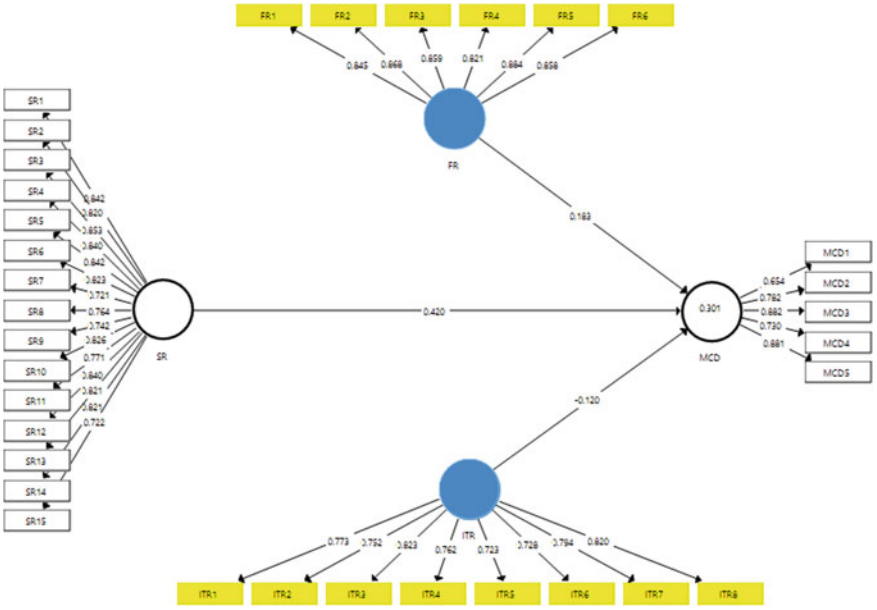

Fig. 3 Measurement model assessment

Table 3 Path analysis

Relationships	Beta	S.D	T statistics	P values	L.L	U.L
FR -> FCPA	0.183	0.059	3.092	0.001	0.069	0.256
ITR -> FCPA	−0.120	0.041	2.961	0.002	−0.216	−0.080
SR -> FCPA	0.420	0.061	6.928	0.000	0.337	0.534

the maintenance of information technology system. Such institutions have shown and are showing good education performance even in the period of covid-19 disaster, as they are able to continue their teaching classes online without even a short gap. Thus, the readiness of information technology has been helpful to educational institutions to cope with the adverse impacts of a covid-19 pandemic. These results are also supported by the recent literary work out of Yan et al. (2020), which investigates

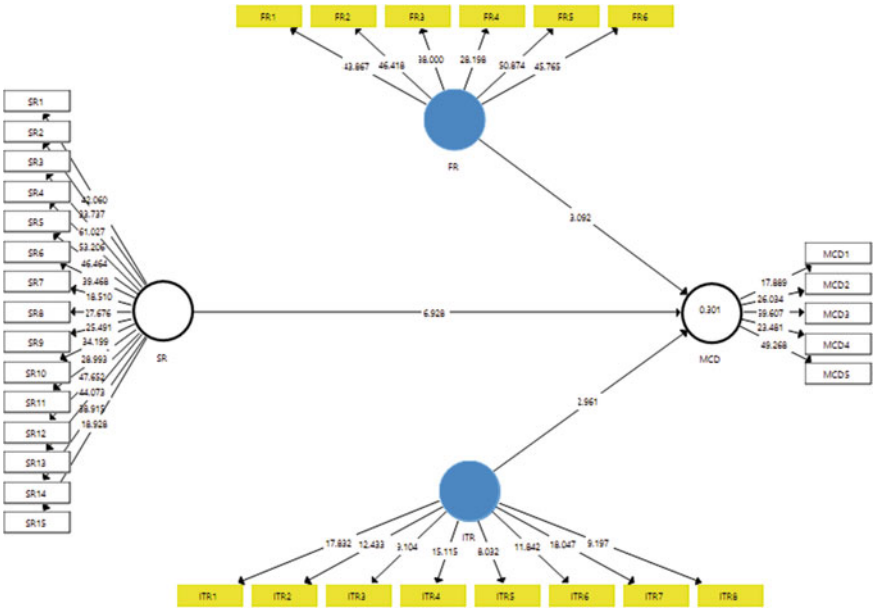

Fig. 4 Structural model assessment

the impacts of a pandemic disaster like covid-19 on the education of a country and the ways how to cope with those impacts. This study concludes that when an education institution has effective information technology (good quality hardware and software, effective network, and good quality infrastructure used in this regard) and takes great care for its maintenance, it can effectively use it for the exchange of information and knowledge. This readiness of information technology helps the institution to minimize the impacts of covid-19 on education because it makes it possible to provide education online. Thus, the readiness of information technology is of great importance to the management of the covid-19 pandemic.

The study results have indicated that the readiness of faculty at educational institutions has positive impacts on the management of the covid-19 pandemic. The study posits that the readiness of the academic staff at school, colleges, or universities for delivering online classes, enables the institution to arrange for delivering online classwork and thus continue their teaching classes. The spreading of the covid-19 pandemic in the country forces the government and the general public alike to close actual teaching or learning classes. In such a situation, the readiness of faculty for online classes helps to mitigate the adverse impacts of a covid-19 pandemic on education. These results are in line with the past study of Cutri et al. (2020). This elaborates that when the teaching staff at any educational institution have the motivation and willingness to prepare, effectively design, and assists courses within an online environment, and they have an interest in delivering online classes, sufficient relevant knowledge, and sufficient experience regarding the delivery of online classes, they

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can overcome the adverse impacts of covid-19. These results are also supported by the previous study of Budur et al. (2021), the teachers having prior knowledge, motivation, and experience in the online teaching class, better know how to design the coursework, arrange for online classes, maintain the students' attention and their attendance online, can deliver knowledge in a better way, and have the same good results from the student as may have during actual teaching classes. These results are also in line with the recent study of Sunarto (2021), which states that when the teachers have the proper knowledge about the online teaching methods, the essentials of online teaching, skills of student interaction, their management during online classes, and time management, they can the problem closure of educational institutions in result of covid-19.

The study results have also indicated that students' readiness for having online learning classes has a positive association with the management of covid-19 pandemic disaster. These results are in line with the past study of Yates et al. (2021). This study analyzes the students' role in education when covid-19 is at the peak. It states that the students who have some prior knowledge about the online classes and the devices, technology, and apps used in this context are more likely to be interested in and benefit from online learning, which helps them cover the education gap which covid-19 has brought. These results are also supported by the recent theoretical work out of Zhu and Liu (2020), that during the spreading of the covid-19 pandemic when most of the educational institutions have been closed for health safety, the mostly those students continue their study and thus, fight against the covid-19 pandemic disaster who have interest in the online education, knowledge, experience, and financial resources which are helpful in getting an online education. These results are also in line with the study of Dong et al. (2020), which elaborates that the student readiness to join and learn from online classes helps overcome the covid-19 disaster.

The current study has both theoretical and empirical implications. This study has great theoretical importance on account of its remarkable contribution to the literature on the Covid-19 pandemic. This study addresses the three essential factors of online education, such as information technology readiness, the readiness of faculty at educational institutions to deliver online classes, and the readiness of students for online learning and their impacts on the management of the covid-19 pandemic. The pandemic covid-19 not only effects the health of people but also affects their activities; it disturbs education and makes the regular actual classes impossible to be carried on at the educational institution. In such a situation, it becomes essential for educational institutions to carry online teaching classes. Since the start of the spreading of covid-19, many authors have dealt with the impacts of a covid-19 pandemic on the people's health, resulting in the close of activities at educational institutions along with other economic and social sectors, and the efforts of the management of covid-19. These studies have either checked the role of students' readiness for the online classes, or teachers' readiness to deliver online classes or the readiness of information technology in managing the covid-19 pandemic. This study proves to be an exception to the literature because it examines the role of information technology readiness, the readiness of faculty at educational institutions, and students' readiness for online

classes to manage the covid-19 pandemic disasters simultaneously. This study has a great empirical significance in all the countries across the world in general and in developed countries like UAE in particular because it's a guideline for the education authority and any education institution management how to manage the covid-19 pandemic. This study suggests that the covid-19 pandemic disaster and its impacts on education can be overcome with the information technology readiness, readiness of faculty at education institution for online teaching, and the student's readiness for online learning.

6 Conclusion and Limitations

The current study analyzes the covid-19 pandemic disaster and its management in education institutions in UAE, a developed state of the world encompassing seven countries. In this regard, the study checks the role of three essential factors the information technology readiness, the readiness of faculty at education institutions for online teaching, and the student's readiness for online learning. The study posits that the readiness and effectiveness of information technology to be used in online classes is helpful for the educational institutions to cope with the disasters of covid-19. When all the components of the information technology such as computer hardware and software applications, digital devices, infrastructure, communication network, availability of fast internet, techniques, and processes to acquire, process, and exchange knowledge and information, makes it possible to overcome the negative impacts of covid-19 disaster on education by assisting online classes. The study suggests that the readiness of faculty at school, colleges, and universities for suddenly turning from actually teaching classes to online classes, is helpful to the organization to mitigate impacts of the covid-19 disaster. When the teachers have the motivation and willingness to prepare, effectively design, and assist course design within an online environment, have sufficient knowledge and experience to deliver online lectures, they can reduce the adverse impacts of covid-19. Similarly, the student's readiness for having online learning classes assists in managing the covid-19 pandemic. The organizations where the students already have initial knowledge of online classes, proper facility of online classes like computer system, relevant software apps, good infrastructure facilities, proper speaker, camera, room space, and time management skills, can effective manage the covid-19 disaster with the continuity of education.

Though the current study has great theoretical and empirical importance, it bears some limitations too, which are expected to be removed in the future by talented scholars. It examines only three factors, such as information technology readiness, the readiness of faculty at education institutions for online teaching, and the student's readiness for online learning while analyzing how to cope with the covid-19 disastrous effects on education. Besides these factors, there are several other factors, like government regulations, SOPs, financial resources of both institutions and parents, the culture of the students' household, teachers' commitment to an organization, and student learning commitment all affect the management of covid-19 pandemic. But

all necessary factors have utterly been ignored by the author in this study. Future authors are recommended to pay attention to these factors along with information technology readiness, faculty readiness, and students' readiness for online classes. Though the covide-19 is a universal pandemic, affecting the educational sectors in most of the countries, this study has checked the management of covid-19 disaster with information technology readiness, the readiness of faculty at education institution for online teaching, and the student's readiness for online learning in the economy of UAE. This has made the validity and reliability of the study very limited. Thus, scholars in the future must increase the number of countries under discussion.

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Evaluation of Blended E-learning from the Perspectives of the German Jordanian University Students

Safa Shweihat

Abstract To achieve e-learning sustainability, the current study aimed to investigate the efficiency of blended e-learning. The researcher developed a special questionnaire consisting of (50) items and two open questions, implemented on a random sample of 50% of the students studying the National Education Course at the German-Jordania University in 2021. The results showed that the total efficiency degree of blended E-learning was moderate: "Electronic Exams" ranked first, "Teaching through Videos" ranked second, "Technical use of the electronic platform" ranked third, "Appropriateness of blended e-learning" ranked four, and "Students' regular study through the electronic platform" ranked last. There were significant differences in favor of the students who dealt seriously with e-learning, with no significant differences in gender, experience, and academic year. The results also demonstrated several advantages and disadvantages of blended e-learning to achieve e-learning efficiency and sustainability, especially for the first-year university students of social studies and humanities. The recommendations focus on some skills that help students be integrated into e-learning, the teaching methods, technological infrastructure, and the model of the optimal education time distribution between e-learning and traditional learning.

Keywords Effectiveness · Blended E-learning · Advantages · Disadvantages · National education course · Students · German Jordanian university

1 Introduction

Like other countries, Jordan has suffered from the problematic learning of its various forms under the COVID-19 pandemic, which imposed using e-learning urgently, rapidly, and suddenly, regardless of educators' and learners' degree of experience skill, and knowledge of e-learning. It has become obligatory to employee-learning

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_19

and relies on it entirely or partially in university education. So it is necessary to conduct evaluation studies to raise the efficiency of education reality in line with the challenges and obstacles of e-learning.

1.1 Theoretical Framework and Previous Studies

Technological progress has contributed to serving man in all aspects of life, especially in education, in terms of rapid performance, accuracy, and sum-up of time and effort. However, the interest rate of both faculty members and students in e-learning remains minimal, with e-mail, audio, and video broadcasting of lectures being of its most minor uses (Al-Abdallah, 2011), especially in the developing countries, who used to focus on face-to-face education, as some categorically reject the idea of online teaching based on many reasons. Moreover, the crisis of the COVID-19 pandemic obliged all these institutions to switch to virtual teaching (Dhawan, 2020).On the other hand, e-learning has widely spread as one of the modern forms of learning, especially in higher education institutions in America, Europe, and other countries that totally or partially rely on this type of education. Recently, e-learning has become a contributor to the income of some universities. For example, "The payment of Phoniex University in the USA from e-learning is (95.5%) of its total income of (1.28) billion dollars in 2004 (Qudhah, 2013). When looking for a competitive advantage for e-learning, the Polish Higher Education System created a legal basis and rules for the use of e-learning, based on the experience of John Paul II's Pontifical University in Krakow (Górska, 2016). Indeed, the difference in judging the spread of e-learning in its various forms is due to the different positioning of countries. Inevitably, the developing countries differ in capabilities and conditions from the developed countries, especially in technology production and use.

From the point of view of Carlines, e-learning is "Learning that occurs through the computer and any other computer-based resources that help in the teaching and learning process. The computer replaces the book or the teacher or both of them, where the educational material is displayed on the screen and the learner is presented the study material based on their response. The scientific material and accompanying tests can be simple, taking the form of an educational program, texts, static or animated graphics, audios or visuals, or all together. E-learning may consist of a course that includes lectures taking place through video conferencing at specific dates, precisely as in the case of traditional education. It can be a page on the internet accompanied by additional material that includes video activities, discussion outside the classroom via e-mail, and electronic tests, the results of which are automatically recorded in the student records (El-Madawy, 2021).

The American Federation for Distance Education has identified the advantages of e-learning that depends on the information network (the internet), as it provides the possibility of moving from a knowledge transfer model to a learner-directed education model, providing reciprocal communication, and encouraging the learner to participate in building knowledge through relying on higher-order thinking skills,

as well as providing learners with participatory and interactive learning and teaching. On the other hand, e-learning may deprive students or learners of learning essential skills such as listening, handwriting, interaction with colleagues, speaking, dialogue, discussion, imitation, debate, simulation, and others (Abu-Aqail, 2014).

It is certain that activating e-learning, benefiting from its advantages, and compensating for the loss of face-to-face education is inevitably related to the experience and skill of those who lead the education process. It is not easy to attract students' attention and motivate them to learn while considering individual differences and their psychological state, and the requirements of people with special needs. Therefore, (Martin, 2020) states that "It is necessary to strengthen online student learning by providing clear instructions to the learner and selecting a well-organized and sequential study content divided into simple parts for the student to understand easily."

2 Literature Review

2.1 Field Studies That Aimed to Investigate the Obstacles and Challenges of E-Learning from Students' Perspectives

The results of a study carried out by Al-Issan (2007) about the perspective of 165 students who study e-courses at the Faculty of Education/Sultan Qaboos University indicated that one of the advantages of e-learning is activating cooperative learning among students, as well as narrowing the gap between student-instructor, and student-student. In addition to giving students the liberty to express their ideas and adequate opportunities to demonstrate their abilities and potentials through student participation, dialogue, and continuous scientific discussions. E-learning also helped in developing their computer skills.

The disadvantages of e-learning are the lack of and the insufficient number of computers for students in the College, and facing difficulties in connecting to the University website from remote places in Oman.

Abu-Aqail (2014) carried out a study on a random stratified sample of 404 students from Hebron University in Palestine. The results indicated that the number of technicians is not so enough for helping all students on how to deal with e-learning,students lack the knowledge of up-to-date technologies; the plentiful of courses students have at one semester, and the absence of e-learning workshops. There are statistical differences in estimating the size of obstacles in favor of females among the first and second-year students of the Faculties of Sharia and Administration.

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2.2 *Field Studies That Aimed to Investigate the Obstacles of E-Learning from the Instructors' Perspective*

Mefleh al-Dahoun (2010) carried out a study on a random sample consisting of 47 male and 58 female teachers selected from the secondary stage teachers et al.-Kurah district in Jordan. The results indicated that the teacher-related obstacles ranked first, followed by administration-related obstacles, then infrastructure and equipment-related obstacles, and finally student-related obstacles. The results showed significant statistical differences in infrastructure and essential equipment in favor of male teachers and teachers with a master's degree and higher.

In a study carried out by Aldhafeeri (2017), a questionnaire was implemented on 1413 faculty members at Kuwait University in Kuwait State. The results show that academic staff at Kuwait University agreed on the necessity of implementing E-learning platforms into their teaching courses. In addition, the study found out that there were some cultural and technical challenges behind the reluctance to use e-learning platforms.

A study was carried out by Qudhah (2013) to identify e-learning challenges perceived by faculty members at the universities in Jordan. A random sample consisting of 113 faculty members from the Jordanian Universities participated in the study. The results indicated that the most critical challenges of e-learning are: scientific research, technical, financial, and administrative challenges, planning, design, and evaluation of e-learning, and no significant differences in challenges attributed to gender, experience, and College.

Al-Abdallah (2011) carried out a field study on a random sample of (113) faculty members and (774) male and female students at Tishreen University/Syria. The results indicated that the most important disadvantages of e-learning are: Sitting for a long time in front of a computer causes many diseases and the unavailability of rooms dedicated to e-learning. There were no significant differences between the mean grades of faculty members in terms of E-learning disadvantages according to the specialization variable. At the same time, there were differences in terms of the advantages and disadvantages of e-learning according to the student specialization variable.

Within the context of the studies that used the experimental approach, Oweis (2018) carried out a study to measure the effect of blended learning on achievement and motivation to learn the English language among the students of the German Jordanian University. An analysis of common variance (ANCOVA) showed statistical differences in student achievement as well as significant differences in the motivation to learn the English language in favor of the experimental group who studied the English language through a computer program mixed with the traditional method (Blended online learning) compared to the control group who studied the English language in the conventional way only. Moreover, a study carried out by Mefleh al-Dahoun (2010) showed a difference in the means of students' scores in the tests of mathematical power and reflective thinking skills in favor of the experimental group

of 90 8th grade students in Jordan who used the e-learning platforms compared with those who used the traditional method.

The study of Al-Fraihat et al. (2020) aimed to evaluate e-learning systems as they are vital to ensuring effective use, successful delivery, and positive effects on learners. After reviewing some previous studies, the researchers developed a comprehensive model that provides a comprehensive picture and identifies different levels of success related to a wide range of determinants of success. By matching the model to data collected from 563 students participating in an e-learning system at a UK university, the model was experimentally validated by the Partial Least Squares Quantitative Method-Structured Equation Modeling (PLS-SEM). The results showed that the determinants of tangible e-learning satisfaction are information quality, technical system quality, support system quality, service quality, teacher quality, learner quality, and perceived usefulness, and these together explain 71.4% of the perceived satisfaction variance. In contrast, the drivers of perceived benefit are information quality, support system quality, technical system quality, teacher quality, and learner quality, and these explain 54.2% of the perceived benefit variance. Whereas four structures were found as determinants of e-learning use: the quality of the support system, the quality of the educational system, the quality of the learner, and the perceived benefit, together they represent 34.1%. Finally, 64.7% of the variance in e-learning benefits was explained by satisfaction, use, and benefit perception.

The study of Al Kurdi et al. (2020a) aimed to determine the factors that affect the acceptance of e-learning by students and to know the intention of students to use e-learning and how these factors are determined. The theoretical framework was developed based on the Technology Acceptance Model (TAM). The sample consisted of 270 university students who used the e-learning system, and a questionnaire was distributed to them. The results showed that "perceived pleasure, social impact, perceived usefulness, self-efficacy, and perceived ease of use" are the strongest and most significant predictors of students' intention towards e-learning systems. The research results provided valuable recommendations that serve as guidelines for the effective design of e-learning systems, and guidance for e-learning practices.

Al Kurdi et al, (2020b) conducted a study to validate the process of accepting and employing e-learning by university students in the United Arab Emirates. The study included a sample of 365 university students, and the structural equation modeling (SEM) method was used based on the Technology Acceptance Model (TAM). This standard structural model included computer self-efficacy, e-learning, system interaction, social impact, computer anxiety, enjoyment, technical support, perceived ease of use, perceived benefit, attitude, and behavioral intent to use e-learning. The results showed that understanding the acceptance of e-learning by users was done using (TAM), a theoretical tool that has proven to be effective. Computer self-efficacy, e-learning, system interaction, computer anxiety, social influence, enjoyment, technical support, perceived ease of use, attitude, and perceived usefulness, followed by behavioral intention to use e-learning, was the most critical construct to explain the causal process used in the model. The findings provide professionals, decision-makers, and developers with practical implications on how effective e-learning systems are.

The results of some recent field studies carried out during -COVID-19 pandemic showed a lack of financial support for employing e-learning, a lack of computers for some students at homes, with students and parents rejecting the e-learning culture (Aldhafeeri, 2017), and that the students suffered from the delay in sending the educational material, and delay in the arrival of educational videos (Chen et al., 2020). In addition, the poor internet connection, especially in remote areas, and the inappropriate study environment is not suitable due to not having separate rooms for them to study remotely from within their homes and across the educational platforms (Saleh, 2019). Students encountered significant challenges upon transition to e-learning during the COVID-19 pandemic, especially since the majority of students around the world do not have the capabilities that enable them to acquire the equipment that helps them attend their virtual classes, and that access to the internet in many regions of the world is difficult to almost impossible (Dhawan, 2020).

The limitations of writing mathematical symbols and the limited basic capabilities of the Learning Management System and multimedia software to support online learning represent other technical obstacles that learners and teachers encounter (Irfan, 2020).

The results of a study (Chen et al., 2020) showed that using e-learning platforms improves students' achievement and improves their level of satisfaction with online learning. The study of Kapadia (2020) found out that there is a large degree of positive impact of the use of distance education and that there are no differences according to the variable of gender. Irfan (2020d) concluded that the overall score for assessing the reality of distance education was moderate, with statistically significant differences in favor of females, with no differences depending on the variable of the educational stage. The results of a study conducted by Abuhassan (2020a) also showed that the degree of both the use of the e-learning management system (Moodle) and the obstacles to using it was moderate and that the trends towards the (Moodle) system were positive. The results of a study conducted by Meqdadi (2020) indicated that e-learning was rated high from the perspective of a random sample that included (120) students from the College of Education at Taibah University in Saudi Arabia, with statistically significant differences in favor of males and the effect of the interaction between gender and the study location.

In general, to the researcher's knowledge, it was noted that most of the previous studies adopted the quantitative research methodology, using the questionnaire, such as the studies carried out by Irfan (2020), Kapadia (2020), Meqdadi (2020). Meanwhile, there is a scarcity of using the qualitative research methodology except for Saleh (2019). There is also a scarcity of studies that combine quantitative and qualitative research. Previous studies dealt with evaluating e-learning in general, except for two studies that evaluated e-learning in specific study subjects, such as the studies carried out by Qudhah (2013) and Saleh (2019), in addition to the scarcity of studies that dealt with blended education except for the study carried out by Qudhah (2013).

The current study has benefited from the previous studies. However, it is distinguished by being the first to evaluate the effectiveness of blended education and its suitability for teaching the course of "National Education" through blended education for students of Jordanian universities on "Edraak" Platform, such as the University of

Jordan, the Hashemite University, Israa University, and LuminusTechnical University College. This means that it is possible to circulate the results of this study to the universities above to benefit from. This study is also considered the first study to evaluate the "Edraak" Platform, as far as the researcher's knowledge is concerned. The comprehensiveness of its five domains also characterizes the study. In addition to the variables used by previous studies, such as gender, experience, and academic level, the current study included the variable of seriousness in dealing with e-learning because the study is applied in a developing society to which E-learning is new. So there are many doubts about the seriousness of students' interaction with E-learning because of the current prevailing culture and the fact that a wide range of the Jordanian community rejects this type of education, including teachers, learners, and parents.

2.3 Study Problem

Despite having some positive trends towards employing e-learning in various educational institutions in Jordan for decades, its use was limited to conducting examinations and monitoring test scores until the requirements of dealing with the COVID 19 pandemic have appeared. The blended e-learning raised problems and negative trends related to inputs, processes, and outputs of e-learning in the time of COVID-19. Academics, researchers, teachers, and students raised problems associated with the low level of required knowledge, experience, and skills. The researcher, being a faculty member in a Jordanian university, has been using blended learning for teaching the course of "National Education" since 2015, and she has an interest in modernizing and updating blended e-learning to keep up with the requirements of the modern age. The current study aims to evaluate the degree of effectiveness of blended E-learning and to investigate the advantages and disadvantages of using blended e-learning from the students' perspective.

2.4 Study Questions

1. What is the degree of effectiveness of blended e-learning for teaching the course of National Education on "Edraak" from the students' perspective?
2. Does the total degree of the effectiveness of blended e-learning for teaching the course of National Education on "Edraak" differ from the students' perspective, in terms of students' gender, academic level, previous experience, and seriousness in dealing with e-learning?
3. What are the advantages and disadvantages of using blended e-learning from the students' perspective?
4. What are the ways to develop the blended e-learning of the National Education course on "Edraak" from the students' perspectives?

2.5 Study Significance

The procedural significance of the current study stems from the importance of uncovering the degree of effectiveness of blended e-learning, in general, and its degree of relevance in teaching the course of "National Education" as a university requirement in Jordanian public and private universities. The current study results benefit both faculty members at Jordanian universities, the National Education curriculum developers, and the technicians responsible for developing Edraak's E-learning platform.

2.6 Procedural Concepts

Effectiveness Degree: The general mean of the study sample's estimates of the degree of effectiveness of blended e-learning, which is achieved by calculating the frequencies and percentages of the responses of the current study sample to the items of the questionnaire prepared for that purpose.

"National Education" Course: A university requirement approved by the Ministry of Higher Learning and Scientific Research in 2005 to teach three credit hours for all undergraduate students at all the Jordanian universities to form a common national and citizenship base for students according to the specifications of a good Jordanian citizen. The course consists of two main aspects: the national part, which focuses on the theoretical side of knowledge, values, and trend-building. And the citizenship part focuses on the behavioral and skills aspects.

Blended Education: A type of e-learning that mixes the existing traditional teaching methods and e-learning. The traditional part requires a physical presence that provides face-to-face interactive instructor-student meetings in the classrooms within the university campus. This type of education is approved for the practical side, which is concerned with developing scientific research skills in national issues, at a rate of 75 min per week for one time. As for e-learning, it takes place through the electronic platform through which the theoretical aspect of the study material is presented. This includes the study plan file and written files related to the study content and presented in a fragmented, sequential, and organized form, as well as video and audio recordings with key phrases through which instructors explain their courses. The videos and teaching files are displayed within a timeline of a weekly lecture that students follow on the platform, with the possibility of the student selecting the timing, place, and speed of viewing the lectures and following them up. The platform is also used to hold exams and monitor test scores. The platform also contains virtual rooms for dialogue and discussion among students and between students and instructors and other places to display pictures of students' activities related to the National Education course.

Edraak E-learning Platform: An Arabic, massive open online course (MOOC) platform, established as an initiative from Queen Rania Foundation for Education and Development (http://www.edraak.org).

The German Jordanian University (GJU): A public university, established in 2005, according to a Memorandum of Understanding between the Ministries of Higher Education and Scientific Research in Jordan and the Federal Republic of Germany, with an applied technological orientation. The university seeks to take serious steps towards internationalization. It aspires to meet all students' lifelong education and training needs in Jordan and the region. Among GJU policies: the enrollment of university students in the last year of study in German universities in Germany (to spend six months at the universities and six months in fieldwork at different worksites, each according to their academic specialization (http://www.gju.edu.jo).

3 Method

The current study has adopted a quantitative research method because it is appropriate for collecting students' data, identifying their evaluation of the effectiveness degree of blended education in various fields of study, and identifying statistical differences and significance. The qualitative research method was also adopted by asking open questions and analyzing students 'responses. We clarify that by detailed explaining upon talking about the study tool.

3.1 Study Variables

The current study includes four independent variables (gender, academic level, previous experience, and seriousness in dealing with blended e-learning) and one dependent variable: the effectiveness of blended e-learning for teaching the course of "National Education" on the" Edraak" Platform.

3.2 Study Limitations

The current study was carried out on undergraduate students at the German Jordanian University in the Governorate of Madaba, Jordan. They are enrolled to study the National Education course taught by blended e-learning in the first semester of the Academic Year 2020/2021. The generalization of the current study results is determined by the degree of effectiveness of the blended e-learning of the National Education course through the Edraak platform, according to the domains of the current study with the relevant items and open questions, as well as the results of the

validity and reliability of the study tool. Furthermore, the study results are circulated to the population of students at the German Jordanian University and similar populations such as the students of other Jordanian universities who study the course of "National Education" through blended e-learning on the "Edraak" platform.

3.3 Study Population and Sample

The study population consisted of undergraduate students enrolled to study the National Education course taught by blended E-learning. They come from different academic specializations at the GJU in Jordan. The study questionnaire was posted on an electronic website and was e-mailed to all students distributed on 12 sections; Fifty percent of the study population responded to the questionnaire. Table 1 illustrates the distribution of the study subjects according to the study variables.

3.4 Study Tool

The literature of the topic and previous studies were reviewed and used to build the current study tool. In its initial form, the study questionnaire consisted of three parts: the first one is student's data, the second is (52) items to measure the degree of effectiveness of blended e-learning according to the Likert five-point scale, and the third is open-ended questions to identify the advantages and disadvantages of blended e-learning, and ways to develop it from the students' perspective.

Table 1 Distribution of the study subjects according to the study variables

Variable	Category	No.	Percentage
Gender	Male	123	49.8
	Female	124	50.2
Academic level	1st Year	146	59.1
	2nd Year	52	21.1
	3rd Year and Higher	49	19.8
Have you ever studied any blended online courses at school or the university?	Yes	148	59.9
	No	99	40.1
Do you write down notes or questions while following upon the course content through videos or reading the material?	Yes	149	60.3
	No	98	39.7

3.5 Subject Validity

The study tool was presented to a group of arbitrators specializing in measurement, evaluation, and social sciences. They were asked to express their opinion on the questionnaire items regarding linguistic integrity and the item's suitability to its domain. Some items were deleted, while others were amended based on the arbitrators' results. The items agreed upon by (80%) or more were adopted. In its final form, the questionnaire consisted of (40) items, divided into five domains: Appropriateness of blended e-learning for the National Education course: (1–9), student follow-up of the subject study through the electronic platform, (10–17), the competence of technical matters(18–26), the effectiveness of the electronic teaching method through the course videos (27–32), and effectiveness of electronic exams on Edraak platform, (33–40).

3.6 Reliability

The reliability of the study instrument was confirmed by using the internal consistency method using the Cronbach-Alpha equation. Table 2 shows the results.

Table 2 shows that the Cronbach Alpha reliability coefficients ranged between (0.916–0.690) and that the overall reliability coefficient of the questionnaire was (0.956). These values are statistically significant and acceptable for scientific research.

3.7 Construct Validity

The questionnaire construct validity was verified by calculating the Pearson Correlation Coefficient between the item's score with the domain to which it belongs on

Table 2 Reliability coefficients using Cronbach Alpha

No.	Domain	Cronbach Alpha value
1	Appropriateness of blended e-learning for the National Education course	0.916
2	Student follow-up the course through Edraak platform	0.835
3	Competence of technical use of Edraak platform	0.690
4	Effectiveness of teaching through the course videos/recordings on the Edraak platform	0.897
5	Efficacy of electronic exams on the Edraak platform	0.891
	The total degree of blended e-learning effectiveness	0.956

Table 3 The values of Pearson correlation coefficients for the questionnaire items with the domain to which they belong and with the total score of the questionnaire

No.	Item correlation with its domain	Item correlation with questionnaire total score	No.	Item correlation with its domain	Item correlation with questionnaire total score
1	0.754**	0.672**	21	0.753**	0.682**
2	0.827**	0.772**	22	0.764**	0.749**
3	0.797**	0.693**	23	0.703**	0.793**
4	0.776**	0.641**	24	0.747**	0.471**
5	0.808**	0.738**	25	0.634**	0.531**
6	0.776**	0.669**	26	0.499**	0.401**
7	0.755**	0.664**	27	0.875**	0.832**
8	0.831**	0.731**	28	0.852**	0.754**
9	0.663**	0.721**	29	0.845**	0.787**
10	0.793**	0.591**	30	0.780**	0.697**
11	0.761**	0.569**	31	0.736**	0.592**
12	0.578**	0.539**	32	0.804**	0.617**
13	0.409**	0.341**	33	0.728**	0.661**
14	0.683**	0.601**	34	0.710**	0.606**
15	0.776**	0.681**	35	0.771**	0.652**
16	0.706**	0.576**	36	0.761**	0.678**
17	0.725**	0.593**	37	0.761**	0.645**
18	0.740**	0.606**	38	0.735**	0.644**
19	0.766**	0.643**	39	0.773**	0.644**
20	0.819**	0.716**	40	0.802**	0.810**

**Significant correlation coefficient at (0.01) level

the one hand and the item score with the total score of the questionnaire on the other hand, as shown in Table 3.

Table 3 shows that the correlation coefficients of the questionnaire items with the domainto which they belong and with the total score of the questionnaire were positive and statistically significant. These values are acceptable for the purposes of the study. This also confirms the structural validity of the questionnaire.

4 Statistical Treatment

To answer the first question of the study questions, the means, standard deviations, rank, and score were used.

To answer the second question of the study questions, four-way ANOVA with the factorial design 2 * 3 * 2 * 2 was used, in addition to the Scheffe test for post hoc comparisons for the academic level variable because it showed statistically significant differences.

The frequencies and percentages were used to indicate the distribution of the study sample according to its variables and the responses to the two open questions. The frequencies of the responses were (203) and (170) to the first and second open questions, respectively. The responses dealing with the disadvantages or advantages were collected with each other, albeit the terms of the respondents are different.

Cronbach-Alpha was used to confirm the reliability of the study instrument through internal consistency.

Pearson correlation coefficient was used to confirm the construct validity of the questionnaire.

Each item of the questionnaire was given a graded weight according to Likert's five-point scale to measure the degree of severity of the obstacles. Very strongly agree (5) degrees, strongly agree (4) degrees, moderate agree (3) degrees, slightly agree (2) degrees, very slightly agree (1) degrees. To determine the cells of Likert five-point scale (the lower and upper limits) range was calculated ($5 - 4 = 1$) and then divided by the number of cells to obtain the cell length, i.e. ($4 \div 3 = 1.33$) and then this value was added to the lowest value in the scale ($1.33 + 1 = 2.33$). Thus, the length of the cells was:—if the mean of the subject responses was (2.33 or less) to a small degree. If it is between (2.34–3.67), it is of a moderate degree, but if the mean is between (3.68–5.00), it is of a large degree.

5 Results

5.1 First Question: What is the Degree of Effectiveness of Blended E-Learning for Teaching the Course of "National Education" on the "Edraak" Platform from the Students' Perspective?

To answer the first question, the means, standard deviations, rank, and the degree of effectiveness of blended e-learning for teaching "National Education" on the " Edraak " Platform from the students' perspective were calculated, as shown in Table 4.

Table 4 indicates that the degree of effectiveness of blended e-learning for teaching "National Education" on the "Edraak" Platform from the students' perspective was moderate in general, where the mean was (3.38) with a standard deviation of (0.76). All the domains of the study instrument were moderate, as the means ranged between (3.21–3.64), with" Exam effectiveness through Edraak platform " ranking first with a mean of (3.64) and standard deviation of (0.93), and "Teaching effectiveness through study material videos/recordings on Edraak platform" ranking second with a mean of

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Table 4 Means, standard deviations, rank, and the degree of effectiveness of blended e-learning for teaching "national education" on "Edraak" from the students' perspective arranged in a descending order

No.	Domain	M	SD	R	Effectiveness degree
5	Exam effectiveness through Edraak	3.64	0.93	1	Moderate
4	Teaching effectiveness through study material videos/recordings on the Edraak platform	3.50	0.95	2	Moderate
3	The efficiency of technical use of the Edraak platform	3.35	0.67	3	Moderate
1	Blended e-learning appropriacy to the National Education course	3.25	1.01	4	Moderate
2	Students follow up their courses through the Edraak platform	3.21	0.89	5	Moderate
The total degree of blended e-learning effectiveness		3.38	0.76		Moderate

3.50 and standard deviation of (0.95). Blended E-learning appropriacy to the National Education course" ranked before the last with a mean of (3.25) and standard deviation of (1.01). Finally, "Students follow up their courses through Edraak platform" ranked last with a mean of (3.21) and a standard deviation of (0.89).

The items of each domain were as follows.

5.1.1 First, Exam Effectiveness Through Edraak

Table 5 indicates that the degree of effectiveness of exams on the "Edraak" Platform from the students' perspective was moderate in general, where the mean was (3.64) with a standard deviation of (0.93). All the items of this domain were high and medium, as the means ranged between (3.30–4.15), with item 37 which states that "The multiple-choice questions are appropriate for the blended e-learning" ranking first with a mean of (4.15) and standard deviation of (1.14), and item38 which states that "The exam questions are varied" ranking second with a mean of(3.96) and standard deviation of (1.09). Item 34, which states that "The instructions for carrying out the exam are sufficient and accurate," ranked before the last with a mean of (3.42) and standard deviation of (1.35). Finally, item 40, which states that "I advise other students to study the course of National Education on Edraak platform in the same way I did." ranked last with a mean of (3.30) and a standard deviation of (1.37).

Table 5 Means, standard deviations, ranks, and degree of exam effectiveness through edraak platform from the students' perspective arranged in a descending order

No.	Item	M	SD	R	Effectiveness degree
37	The multiple-choice questions are appropriate for the blended E-learning	4.15	1.14	1	High
38	The exam questions are varied	3.96	1.09	2	High
36	The exam questions are from within the course material	3.71	1.17	3	High
39	The vocabulary of the exam questions is understandable	3.63	1.24	4	Moderate
33	The test guidelines are visible	3.49	1.31	5	Moderate
35	I trust the results of the National Education exam on the Edraak platform	3.46	1.23	6	Moderate
34	The instructions for carrying out the exam are sufficient and accurate	3.42	1.35	7	Moderate
40	I advise other students to study the course of National Education on the Edraak platform in the same way I did	3.30	1.37	8	Moderate
Degree of exam effectiveness through Edraak platform		3.64	0.93		Moderate

5.1.2 Second, Effectiveness of Teaching Through the Course Videos/Recordings on the Edraak Platform

Table 6 indicates that the degree of effectiveness of teaching through the course videos/recordings on the Edraak platform from the students' perspective was moderate in general, where the mean was (3.50) with a standard deviation of (0.95). All the items of this domain were moderate, as the means ranged between (3.30–3.65), with item29 which states that "Adequacy of accompanying phrases that appear on the screen synchronized with teachers' explanation in all video recordings" ranking first with a mean of (3.65) and standard deviation of (1.16), and item27 which states that "Adequacy of the content of explaining the material in the video recordings, including all the content of the course unit" ranking second with a mean of3.57 and standard deviation of (1.13). Item 32 states that "The method of teaching adopted by teachers is at a similar degree of competence." ranked before the last with a mean of (3.45) and standard deviation of (1.15). Finally, item31, which states that "I like

Table 6 Means, standard deviations, ranks, and degree of effectiveness of teaching through the course videos/recordings on edraak platform from the students' perspective arranged in a descending order

No.	Item	M	SD	R	Effectiveness degree
29	Adequacy of accompanying phrases that appear on the screen synchronized with teachers' explanation in all video recordings	3.65	1.16	1	Moderate
27	Adequacy of the content of explaining the material in the video recordings, including all the content of the course unit	3.57	1.13	2	Moderate
30	The teacher delivers the material at an appropriate speed	3.52	1.20	3	Moderate
28	Teaching the concepts of the National Education at a single level on the Edraak platform is within the diversity of teachers in each course unit	3.49	1.13	4	Moderate
32	The teaching method adopted by teachers is at a similar degree of competence	3.45	1.15	5	Moderate
31	I like the diversity of teachers in the recording videos of the National Education course	3.30	1.26	6	Moderate
Degree of the effectiveness of teaching through the course videos/recordings on the Edraak platform		3.50	0.95		Moderate

the diversity of teachers in the recording videos of the National Education course." ranked last with a mean of (3.30) and a standard deviation of (1.26).

5.1.3 Third, Efficiency of Technical Use of Edraak Platform

Table 7 indicates that the degree of efficiency of technical use of the Edraak platform from the students' perspective was moderate in general, where the mean was (3.35) with a standard deviation of (0.67). All the items of this domain were moderate, as the means ranged between (2.74–3.64), with item 23, which states that "The videos cover all the course content" ranking first with a mean of (3.64) and standard deviation of

Table 7 Means, standard deviations, ranks, and degree of efficiency of technical use of Edraak platform from the students' perspective arranged in a descending order

No.	Item	M	SD	R	Efficiency degree
23	The videos cover all the course content	3.64	1.18	1	Moderate
18	It is easy for students to open an account on the electronic platform	3.57	1.26	2	Moderate
21	I am familiar with the terminology used on the platform	3.56	1.14	3	Moderate
22	The course contents are adequately organized on the platform	3.54	1.19	4	Moderate
20	Dealing with the electronic platform is easy	3.47	1.25	5	Moderate
19	The instructions for using the platform are accurate and sufficient	3.42	1.32	6	Moderate
26	Matching the exam score that appears on the screen directly with the student's score report	3.29	1.01	7	Moderate
24	Sometimes I encounter problems with opening an Edraak website	2.95	1.37	8	Moderate
25	I encountered technical problems while taking the exam	2.74	1.48	9	Moderate
Degree of efficiency of technical use of Edraak platform		3.35	0.67		Moderate

(1.18), and item 18 which states that "It is easy for students to open an account on the electronic platform" ranking second with a mean of3.57 and standard deviation of (1.26). Item 24, "Sometimes I encounter problems with opening an Edraak website," ranked before the last with a mean of (2.95) and a standard deviation of (1.37). Finally, item 25, which states that "I encountered technical problems while taking the exam," ranked last with a mean of (2.74) and a standard deviation of (1.48).

5.1.4 Fourth, Appropriateness of Blended E-learning to the National Education Course

Table 8 indicates that the degree of appropriateness of blended e-learning to the National Education course on the Edraak platform from the students' perspective was moderate in general, where the mean was (3.25) with a standard deviation of (1.01). All the items of this domain were moderate, as the means ranged between (2.87–3.55), with item 9 which states that "The course material is upgraded on "Edraak" platform in terms of national developments and challenges" ranking first with a mean of (3.55) and standard deviation of (1.16). Item 1 states that "For me, the importance of the National Education course was not affected as it is taught by blended E-learning" and item 3 states that "In general, the National Education topics

are commensurate with the blended e-learning" ranking second with a mean of3.38 and standard deviation of (1.30) and (1.24)respectively. Item 8, which states that "I enjoy following up the National Education course through e-learning," ranked before the last with a mean of (2.94) and standard deviation of (1.37). Finally, item 7, which states that "Studying national education through blended e-learning adds an element of diversity and keeps the feeling of boredom away," ranked last with a mean of (2.87) and a standard deviation of (1.43).

5.1.5 Fifth, Students' Following up the Course Material Through Edraak Platform

Table 9 indicates that the degree of students' following up the course material through the Edraak platform from the students' perspective was moderate in general, where the mean was (3.21) with a standard deviation of (0.89). All the items of this domain were moderate, except for one high item, as the means ranged between (2.73–3.70), with item 13, which states that "I prefer to follow the lessons through the attached written material" ranking first with a mean of (3.70) and standard deviation of (1.16), and item 14 which states that "When following the lessons, I sometimes, mix the reading material with the videos" ranking second with a mean of 3.55 and standard deviation of (1.22). Item 16, which states that "I shared conversations with my colleagues about the course material on Edraak platform," ranked before the last with a mean of (2.86) and a standard deviation of (1.40). Finally, item 17, which states that "I asked the instructor some questions through Edraak platform," ranked last with a mean of (2.73) and a standard deviation of (1.37).

5.2 Second Question: Does the Total Degree of the Effectiveness of Blended E-learning for Teaching National Education on "Edraak "Platform Differ from the Students' Perspective, in Terms of Students' Gender, Academic Level, Previous Experience in Using Blended E-learning, and Seriousness in Dealing with Blended E-learning?

Means and standard deviations of the total degree of the effectiveness of blended e-learning for teaching National Education on Edraak Platform from the students' perspective were calculated in terms of the variables of students' gender, academic level, previous experience in using blended e-learning, and student seriousness in dealing with blended e-learning, as shown in the following table.

Table 10 shows that there are apparent differences between the means of the total degree of the effectiveness of blended e-learning for teaching National Education on Edraak Platform from the students' perspective in terms of the variables of students'

Table 8 Means, standard deviations, ranks, and degree of appropriateness of blended. E-learning to the national education course on edraak platform from the student perspective arranged in a descending order

No.	Item	M	SD	R	Appropriacy Degree
9	The course material is upgraded on "Edraak" platform in terms of national developments and challenges	3.55	1.16	1	Moderate
1	For me, the importance of the National Education course was not affected as it is taught by blended e-learning	3.38	1.30	2	Moderate
3	In general, the National Education topics are commensurate with the blended e-learning	3.38	1.24	2	Moderate
2	The nature of the National Education objectives is commensurate with the blended e-learning	3.36	1.16	4	Moderate
4	National Education develops a sense of belonging to the country through blended e-learning	3.32	1.23	5	Moderate
5	National Education develops a sense of social responsibility through blended e-learning	3.30	1.27	6	Moderate
6	The video recordings of the course material make up for the teacher's explanation in class	3.13	1.52	7	Moderate
8	I enjoy following up the National Education course through blended e-learning	2.94	1.37	8	Moderate
7	Studying national education through blended e-learning adds an element of diversity and keeps the feeling of boredom away	2.87	1.43	9	Moderate

(continued)

Table 8 (continued)

No.	Item	M	SD	R	Appropriacy Degree
Appropriateness degree of blended e-learning to the National Education course		3.25	1.01		Moderate

Table 9 Means, standard deviations, ranks, and degree of students' following up the course material through edraak platform from the students' perspective arranged in a descending order

No.	Item	M	SD	R	Follow up degree
13	I prefer to follow the lessons through the attached written material	3.70	1.16	1	High
14	When following the lessons, I sometimes mix the reading material with the videos	3.55	1.22	2	Moderate
11	I study the course material following the schedule	3.42	1.27	3	Moderate
10	I follow up all the course videos on the Edraak platform according to the specific weekly schedule sequence	3.41	1.30	4	Moderate
12	I prefer to study through videos	2.99	1.35	5	Moderate
15	I viewed the supporting materials such as interviews with national figures and other materials on the Edraak platform	2.99	1.33	5	Moderate
16	I shared conversations with my colleagues about the course material on the Edraak platform	2.86	1.40	7	Moderate
17	I ask the instructor some questions through the Edraak platform	2.73	1.37	8	Moderate
Degree of students' following up the course material through Edraak platform		3.21	0.89		Moderate

gender, academic level, previous experience in using blended e-learning and student seriousness in dealing with blended E-learning. To determine whether the differences between the means are statistically significant at the significance level($\alpha = 0.05$), the four-way ANOVA analysis with the factorial design 2 * 3 * 2 * 2 was applied. Table 11 shows the variance analysis results.

Table 11 shows that there are no significant differences at the significance level ($\alpha = 0.05$) of the total degree of the effectiveness of blended e-learning for teaching National Education on the Edraak platform from the students' perspective in terms of the variable of students' gender, based on (F) value which is (1.490) with a significance level of (0.223). There are no significant differences in terms of the variable of using blended e-learning before, based on (F) value which is (0.012) with a significance level of (0.914). At the same time, there was a significant difference in terms of the variable of student seriousness of dealing with blended e-learning, based on (F) value which is (18.790) with a significance level of (0.000). The difference of this

Table 10 Means and standard deviations of the total degree of the effectiveness of blended E-learning for teaching national education on Edraak platform from the students' perspective in terms of the variables of students' gender, academic level, previous experience in using blended E-learning and student seriousness in dealing with blended e-learning

Variable	Category	No.	M	SD
Gender	Male	123	3.43	0.75
	Female	124	3.33	0.78
	Total	247	3.38	0.76
Academic level	1st year	146	3.25	0.79
	2nd year	52	3.55	0.73
	3rd year and higher	49	3.57	0.63
	Total	247	3.38	0.76
Previous experience in using blended E-learning	Yes	148	3.41	0.76
	No	99	3.34	0.77
	Total	247	3.38	0.76
Student seriousness in dealing with blended E-learning	Yes	149	3.55	0.64
	No	98	3.12	0.86
	Total	247	3.38	0.76

Table 11 The four-way ANOVA analysis to find out significance of differences between the means of the total degree of the effectiveness of blended E-learning for teaching national education on Edraak platform from the students' perspective in terms of the variables of students' gender, academic level, previous experience in using blended E-learning and student seriousness in dealing with blended E-learning

Source of variance	Total squares	Freedom degree	Square means	F value	Significance level
Gender	0.784	1	0.784	1.490	0.223
Academic level	4.700	2	2.350	4.464	0.012
Use of blended E-learning	0.006	1	0.006	0.012	0.914
The seriousness of dealing with blended E-learning	9.893	1	9.893	18.790	0.000
Error	126.890	241	0.527		
Total	143.299	246			

variable was in favor of the students who answered with (yes) since their mean was (3.55), which is higher than the mean of the students who answered with (No), which was (3.12). There were significant differences in terms of the variable of academic level, based on (F) value which was (4.464) with a significance level of (0.012).

Table 12 Results of Scheffe test for post hoc comparisons for differences in the total degree of the effectiveness of blended E-learning for Teaching National Education on Edraak Platform from the Students' Perspective in terms of the variable of students' academic level

Academic level	M	3rd year and higher	2nd year	1st year
		3.57	3.55	3.25
3rd year and higher	3.57	–	0.02	*0.32
2nd year	3.55		–	*0.30
1st year	3.25			–

Scheffe test for post hoc comparisons was used to determine whether any group's differences were in favor, as shown in Table (12).

Table 12 indicates that the difference was in favor of the students of the third year and higher and in favor of the second year students compared with the first-year students.

5.3 *What Are the Advantages of Using Blended E-learning Through the Edraak Platform?*

The frequencies and percentages of student responses were calculated to answer this question, as shown in Table 1).

Table 13 indicates that "Flexibility and the ability to open the platform at any time convenient for the student" gained the highest frequency of 75 and 37% of the total number of respondents, followed by" having no advantages" with a frequency of 30 and 14.8%. The advantages of "The material is presented in an organized manner," "having a second source of learning", and "Increasing the learning effectiveness and facilitates learning" were ranked last with a frequency of 1 and a percentage of 0.5% for each of them.

5.4 *What Are the Disadvantages of Using Blended E-learning Through the Edraak Platform?*

The frequencies and percentages of student responses were calculated to answer this question, as shown in Table 14.

Table 14 indicates that" lack of appropriate interaction between students and lecturer" gained the highest frequency of 53 and percentage of 31.2%of the total number of respondents, followed by" having no disadvantages" with a frequency of 31 and 18.2%. The disadvantages of "getting bored", change of instructors, and difficulty taking the exam through Edraak were ranked before the last item with a frequency of 5 and a percentage of 2.9% for each of them. Finally, the disadvantage

Table 13 Frequencies and percentages of student responses about the advantages of blended E-learning through Edraak

Responses	Frequency	Percentage
Flexibility and the ability to open the platform at any time convenient for the student	75	37
No advantages	30	14.8
Ease of access to material content	26	12.8
Save time and effort	19	9.4
Add some fun	17	8.4
Diversity in teaching methods	16	7.9
Comfort as you attend the lecture at home	11	5.4
A detailed explanation of material and whom it is presented with readings	2	1.0
Instructors understand the stress	2	1.0
I don't know	2	1.0
The material is presented in an organized manner	1	0.5
The second source of learning	1	0.5
Increase the learning effectiveness and facilitates learning	1	0.5
Total	203	100.0

Table 14 Frequencies and percentages of student responses about the disadvantages of blended E-learning through Edraak

Responses	Frequencies	Percentage
Lack of appropriate interaction between students and lecturer	53	31.2
No disadvantages	31	18.2
Instructions not clear	18	10.6
The website frequently breaks down	18	10.6
Exam time is not enough	16	9.4
One may get bored while attending	9	5.3
Plentiful	8	4.7
Getting bored	5	2.9
Change of instructors	5	2.9
Difficulty taking the exam through Edraak	5	2.9
Learning at home is distracting with a lack of concentration	2	1.2
Total	170	100.0

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of "Learning at home is distracting with lack of concentration" came last with a frequency of 2 and a percentage of 1.2%.

6 Discussion

The current study aimed to investigate the total efficiency degree of blended e-learning in five domains and to identify the advantages and disadvantages of teaching the "National Education" course from the perspective of the German Jordanian University students. The results showed that the total efficiency degree of blended e-learning was moderate, which is somehow satisfactory, considering the instructors' and students' novel experience in el-learning and the efficiency level of e-learning infrastructure.

The results showed the following descending order of the efficiency degree of the study domains:

The domain of "Electronic Exam Efficiency" ranked first because the multiple-choice questions used on the electronic platform are preferred by students, as they are characterized by diversity, comprehensiveness, ease, and speed of performance, all of which conform with the university students' requirements. In addition, the software used in such kinds of exams does not consume high bundles of the internet and can be installed on smartphones, thus providing freedom to select where to take the exam without restrictions.

The domain of "Efficiency of Instruction through Videos" ranked second, as the videos provide students with the freedom to choose the time to attend the course electronically, and in a way that suits their circumstances, in addition to the ability to re-play certain clips, to review the material again and again, and the element of suspense in presenting the educational material in videos, audios, and motion. What gives weight to this analysis is the fact that the paragraph "Flexibility of e-learning…" got the highest rate of (37%) of the total number of respondents in terms of the advantages of blended e-learning (Table 13).

The domain of "Efficiency of Technical Use of the Electronic Platform" ranked third, where the students found out that the study material is presented in a way that keeps pace with modern time, as it is updated with the latest developments and national challenges, with the fact that the significance of the "National Education" course was not influenced by its being taught online.

The "Appropriateness of Blended E-learning to the National Education Course" domain ranked four, relatively low. This is because the students believe that the topics of the National Education "course require discussion and dialogue precisely like the direct teaching method in the classroom, which is an urgent necessity to achieve the goals of building values and attitudes and for students to form their opinions as it is in the social and human sciences. This indicates that the students need more direct traditional meetings, especially if the National Education credit hours are divided equally between digital online education and face-to-face education.

The domain of "Attending Courses on Platforms Regularly" ranked last. Here lies the defect of e-learning as students are free to select the time of attending their courses, which is a negative aspect when students don't acquire the skills adequate for time management and self-management, with the result of irregular attendance, especially if this is accompanied with the lack of a technique that helps instructors print out attendance reports for students. Another factor is the number and duration of course videos since students don't have enough time because of the huge study responsibilities students bear. Thus they tend to read the written material on Word documents available on the e-platform to save time. The results also showed no significant differences in estimating the total efficiency degree of blended e-learning in terms of students' gender and academic level. This means that both male and female students from different academic levels and regardless of their previous experience in blended e-learning agree that the total efficiency degree of blended e-learning was intermediate. There were significant differences in student seriousness in dealing with blended e-learning, in favor of students who take down their notes of the online courses, making them more understanding and absorbed in the study materials than others.

Results shown in Table 14 indicate that the advantage that obtained the highest frequency of 75 with a rate of 37% of the total number of respondents is due to the flexibility of blended e-learning, followed by 14.8% of the respondents who consider that there are no advantages. This indicates having challenges accompanying e-learning related to the language, limited accessibility available to them such as a fast and robust network, or issues related to the devices they use (laptop or mobile), an electric power outage at some areas. Having no appropriate interactions between students and lecturers through blended e-learning was the highest disadvantage, with a rate of 31.2% of the total number of respondents.

Considering the features of the study objectives that distinguish it from previous studies, it can be said that there is an agreement between some of the details of the current study with previous studies and having points of difference. The results of this study are consistent with the results of the study carried out by Irfan (2020), regarding the result that the use of educational platforms leads to improving student outcomes and improving their level of satisfaction with the use of online learning. While the study carried out (Abuhassan, 2020a) concluded a positive impact of using online learning to a very large degree, the current study concluded that the total efficiency degree of teaching "National Education" course via blended e-learning is intermediate, with an agreement that there are no differences that can be attributed to the gender variable. Furthermore, the current study is consistent with the results of the study carried out by Al Kurdi et al. (2020a, b), Meqdadi (2020), which indicated that the total degree of estimating the reality of distance education came was intermediate, with no differences according to the variable of the study stage. Indeed, the time of carrying out the current study and the differences in terms of its population, sample, tool, and detailed objectives play an important role in determining the points of agreement or disagreement with the results of previous studies.

7 Conclusion

- Time management, self-management, and students dealing with blended e-learning seriously are significant factors in making blended e-learning succeed.
- The distribution of the "National Education" course into a model of one third for e-learning and two thirds for traditional interactive meetings between instructor and students is the most appropriate model for the instruction of "National Education" due to the students' need for direct dialogue and discussion, and the instructor's need for having a direct impact on their students, in terms of building attitudes and values.
- Flexibility in students' freedom of choice of watching online lectures is the most significant advantage of e-learning from students' point of view.

8 Recommendations

- Hold training courses for students to develop the skills of self-management and time management among students of e-learning because of their significance in raising the regularity of online attending of courses.
- Provide the faculty with a technique for monitoring students 'attendance of online lectures, as it provides instructors with the possibility of following up and urging absent students to adhere to attendance.
- Develop students' skills in preparing the schedules of study responsibilities and an appropriate time distribution that students can adhere to.
- Guide students to deal seriously with the blended e-learning system, as the student's taking down of notes makes them more absorbed into the educational material.
- Ensure the provision of suitable equipment for students and the establishment of adequate technological infrastructure in terms of quality, speed, and endurance.
- Adopt a model of one-third of the credit hours for blended e-learning, and two-thirds of
- direct instruction for its relevance in the teaching and learning social and national studies, instead of the half by half model, where the need for direct interaction is more.
- Provide sufficient opportunities for cooperative student work and the participation of students in dialogue and discussion in class meetings to compensate for the missing part in e-learning.
- Expand the study of the advantages and disadvantages of e-learning using the method of group interviews.
- Carry out future studies on the challenges of blended e-learning.

Funding This research obtained a Financial support from the German Jordanian University, Document No. 14/ 34/3/53/1 on 6/7/2020.

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Evaluating Software Quality in E-Learning System by Using the Analytical Hierarchy Process (AHP) Approach

Case Study: Mu'tah University

Asmaa Jameel Al Nawaiseh

Abstract This study defines and analyzes essential quality characteristics that should be addressed in the creation and implementation of an E-learning system in institutes, as well as its System Content's Quality, Characterizes, and Attributes. The model was empirically validated by fitting it to data from 302 students who participated in an E-learning AHP. All of the evaluated end-users were compared using the pairwise comparison technique in one of Jordan's colleges. Student Oriented Domain, Online Services, and Content Quality are the three sub characteristics of System Content Quality; each sub characteristic has its own set of traits that are used to determine the evaluation's outcome. The Analytical Hierarchy Process (AHP) has been widely employed in multi-criteria decision-making for a variety of practical decision-making situations. The AHP model was used to collect pairwise comparison judgments from all evaluated end users.

Keywords Information system · E-learning system · COVID-19 epidemic · AHP · Priority pairwise comparison · Quality models · Academic · Information system · ISO 9126

1 Introduction

In our published paper (Al_Nawaiseh et al., 2020a), we proposed and built a new quality model dedicated to Academic Information System (AIS) to support a standard set of software quality characteristics.

Software Content must be evaluated as one of the software quality aspects to be considered in the E-Learning System to determine the level of System Content software. The same new model has been improved in. (Al_Nawaiseh et al., 2020a)

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_20

by identifying new attributes for the model's sub-characteristics and defining metrics rules to measure the quality of these new attributes.

The attributes are separated, as are the metrics and criteria that go with them. Furthermore, several existing methods for selecting E-Learning System components have been reviewed, and their shortcomings in comparison to the improved model have been identified.

E-Learning System Quality Evaluation is a paper that discusses an evaluation of the System Contents Quality characteristics on an E-learning system using our proposed software quality model (ESQE) (Al_Nawaiseh et al., 2020a; Almajali, 2016). The critical quality characterizes system content that should be taken into account to ensure the successful development and implementation of the E-learning system in institutes.

Student Oriented Domain, Online Services, and Content Quality are the three sub qualities of the Content Quality characteristic. Each sub characteristic has its own set of traits that are used to determine the evaluation's outcome. The enhanced model is tested with the support of AHP through an empirical study.

Mu'tah University is considered in this study to test and evaluate the quality of E-learning in its camps to aid system analysts, developers, and programmers in the implementation of their eLearning initiatives. Because of the evaluations, the recommendations will address both the construction and maintenance of the target system E-learning System, as well as the system's long-term consequences. The empirical study here follows the following strategy:

- For each of the quality attributes, an evaluation is made for an eLearning System in the sample study, and then the pairwise comparison judgment is determined.
- A questionnaire for the characteristics, sub-characteristics, and attributes is developed and deployed to obtain appropriate weight values that represent the relationships between each pair of attributes.

2 Literature Review

It would be beneficial to analyze the characteristics of actual QIS models and frameworks and then examine their applicability to the contextual production of software in universities. This paper summarizes and integrates the limited literature on models and frameworks of software quality and then constructs a new model to evaluate their relevance to the quality of the information system.

In Jordanian universities, (e-learning system). The quality of the software is the most important aspect of software development since the high quality will reduce the cost of maintenance and reuse of software. For developers, students, and staff, however, quality has very different definitions. The quality definitions and quality characteristics of several high-level institutes and organizations are (Al-Adwan et al., 2018a; Almajali, 2016).

Software Quality can be defined as: The researcher presents some definitions of international and standard organizations.

1. **ISO9126**: "Software quality characteristics is a set of attributes of the software product by which its quality is described and evaluated". (ISO/IEC TR, 9126-3, 2003).
2. **German Industry Standard Part II**: "Quality comprises all characteristics and significant features of a product or an activity which relate to the satisfying have given requirements".
3. **American National Standards Institute/American Society of Quality Control (ANSI/ASQC A3/1978)**: "Quality is the total of features and characteristics of a product or a service that bears on its ability to satisfy the given needs". (Alrawashdeh et al., 2013)
4. **Institute of Electrical and Electronics Engineers (IEEE)**: suggested some definition of quality.

> The composite characteristics of software that determine the degree to which the software in use will meet the expectations of the customer.

All these definitions give separate views on quality. Thus, the researcher needs to organize, clarify, and standardize a large number of quality-related definitions to obtain the best definitions for quality assurance.

2.1 E-Learning as Comprehensive Information System

E-Learning systems enable faculty members to manage their courses electronically and to use technology tools in teaching and communicating with their students. The E-Learning system is a relatively new set of software tools that have been used in educational settings for less than a decade.

Furthermore, E-Learning allows instructors to expand the classroom beyond its traditional time and space constraints (Al-Fraihat et al., 2020; Al-Shboul et al., 2013).

The example of E-Learning demonstrates that this system is a comprehensive system that requires the integration of all subsystems in universities as a platform that primarily addresses education, especially in this critical time of the COVID-19 Epidemic.

Now Administrative regulations, such as course enrolment, are included in E-Learning Systems, just like they are in traditional software. However, such a system would be unable to account for all of the restrictions and constraints. Online registration isn't error-free unless it's connected to administrative systems, which may demand manual enrollment list updates (Nagarajan & Jiji, 2010).

This necessitates a special need for interoperability, which includes the support of multiple formats as well as metadata access. In addition to describing the course content, metadata are data about data in other educational administration systems. As a result, there is a big demand for reusing teaching materials in digital learning systems (Al-Fraihat et al., 2020).

2.2 *Platform of E-Learning System at Mu'tah University*

Universities in various countries have responded to E-learning in their educational institutions in various ways, depending on the regulations. Before the COVID-19 Epidemic, Mu'tah University in Jordan's south adopted the blended learning approach, which is a hybrid of traditional learning and online learning, as did all Jordanian universities.

This means that students attend online lectures while also receiving all learning materials online from a variety of educational platforms, in addition to the Electronic Assessment for assignments and E-Exam. Mu'tah University has been using Moodle since 2005 to create a well-structured E-learning platform and Learning Management System (LMS).

LMS users at the Mu'tah University are classified into five categories according to their authorities: an editing-teacher, non-editing teacher, student administrator, creator, and guest where each one has different roles (Fig. 1).

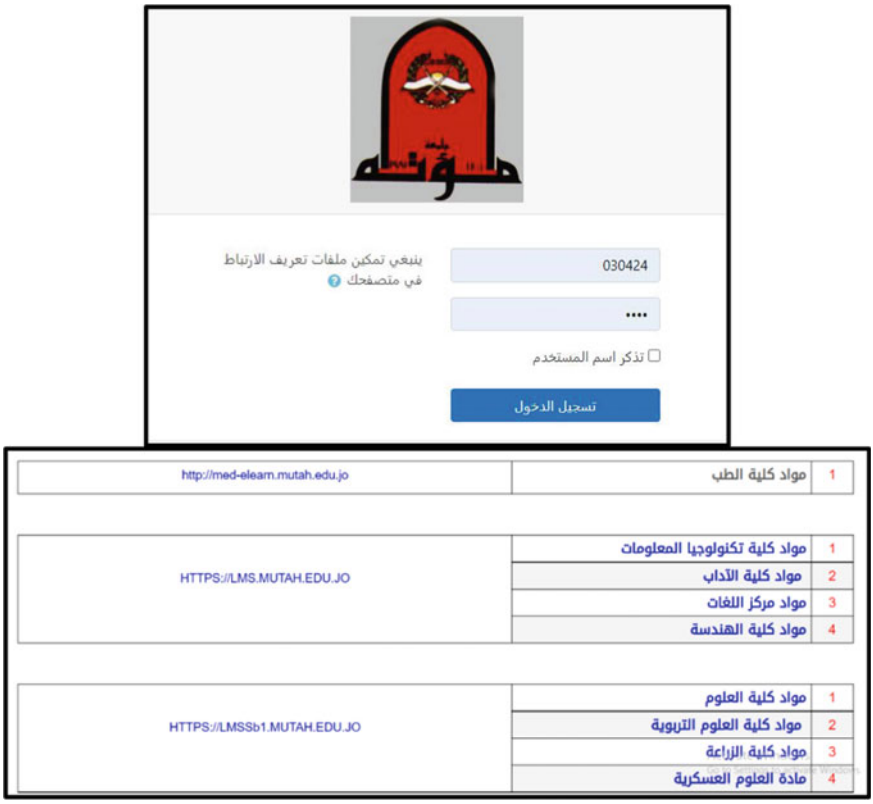

Fig. 1 Mu'tah University E-learning platform homepage

3 Research Objectives

The objectives that the research seeks to achieve are:

1. To clarify the concept of quality in information systems, as the information constitutes a unique resource No matter what companies must exploit it efficiently and successfully.
2. Identify basic attributes and their sub-attributes for measuring software quality in information systems, and identifying relationships between them in preparation for comparison, to detect potential weaknesses, and overcome them.
3. Study the integration of the basic and sub-factors of quality measurement in the applied information systems in the universities.
4. These suggest solutions and recommendations avoid most of the gaps and constraints that affect the effectiveness of measurement quality and success in the information systems applied in universities.
5. A common approach will be to establish measures and evaluate the quality of the AIS, consisting of various global quality levels of software, which will assist system analysts, system developers, and system programmers in their AIS projects
6. These create a standard approach that tests, assesses, and strengthens existing models of quality.
7. Save time and effort by choosing high-efficiency applications to support high-school information Systems.

4 Important of Research

All universities can benefit from this novel model by implementing an eLearning system that meets all of the qualities and conditions recommended in this research and serves as a measure of the efficiency of their systems; additionally, they will save time and effort in selecting high-efficiency software to support the Information Systems within their higher education sector.

Our novel model will represent the university's exterior image, so the university's systems will serve as a road map for visitors to the page, whether they are new students or their guardians. Another advantage is that it saves time and effort when it comes to picking high-efficiency software to support Information Systems in the higher education sector.

5 Previous Studies

Etaati et al., (2011) build their new E-Learning System model Based on ISO9126 attributes, their model consists of three key criteria, the (Wang model) and twenty-nine sub-criteria, "learning Community, System Contents and Interactivity." The

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sub-attributes of Device Material have (up-to-date, sufficient, and useful content). They evaluated their new quality model in three well-known universities in Iran by using standard AHP calculations for selecting the most appropriate E-Learning System features.

All of these Universities provided high-standard E-Learning Systems for students and staff, the researcher has captured information by conducting structured interviews with students and staff.

Baklizi and Alghyaline (2011) publish a study about how to evaluate the E-Learning website of Jordan universities based on ISO/IEC 9126 standard, which uses six main characteristics to evaluate software, and each characteristic includes its sub-characteristics. The results show that the average quality in E-Leaning websites is 65.45%. The results reflect the student's opinion about the website and might be used to improve the quality of E-Learning websites for those universities. This paper evaluates the quality of the E-Learning website for Jordan universities based on ISO/IEC 9126 standard by using the six characteristics: Functionality, Reliability, Usability, Efficiency, Maintainability, Portability, and its sub-characteristics. The respondents in this study are the students only; they do not have experience in educational software with academic information systems. If the academic staff with information developers participate also, the study will become more accurate.

Alrawashdeh et al., (2013) measuring the quality of the Enterprise Resource Planning System (ERP) to propose an acceptable software quality model for ERP systems, the author highlighted the most common software quality models in the literature; these are versions (McCall's, Dromey's Boehm, FURPS, and ISO\IEC 9126). The resulting quality model was used to check whether the ERP job in an educational institution evaluating the quality of the ERP from the user's side could succeed or failed. The same authors introduced a new ERP System Consistency Model (Alrawashdeh et al., 2013), called (ERPSQM). With its complexity and modularity, the Enterprise Resource Planning (ERP) framework has a different type of principles, real-time information and standardization is the essential function of the ERP system. Under the Flexibility, Usability, and Maintainability stage, four new sub-features were introduced, including (Modularity, Compatibility, Complexity, and Reusability). In their analysis, the Hierarchy Method (AHP) was used to assess the consistency of the proposed model, ranking its features and attributes by end-users.

Yuhana et al. (2014) A framework was proposed to assess the quality of web-based AIS using the perception approach of visitors, developers, and institutions. Their AIS quality instrument is based on a variation of the "WBA Quality Model" and "COBIT 4.1" (ISO/IEC 9126, ISO/IEC 25,010:2011) (Fig. 2).

The purpose of the evaluation is to determine the usability behaviors at the AIS administration module using ISO/IEC 9126 a standard software quality.

The results indicate that Learnability is not implemented. This framework was expected to produce a measurement of academic quality web-based information systems more accurately and provide detailed recommendations to gain a better system, especially to support the E-Business processes of AIS and web-based technology. This proposal works not implemented in a real-world case study.

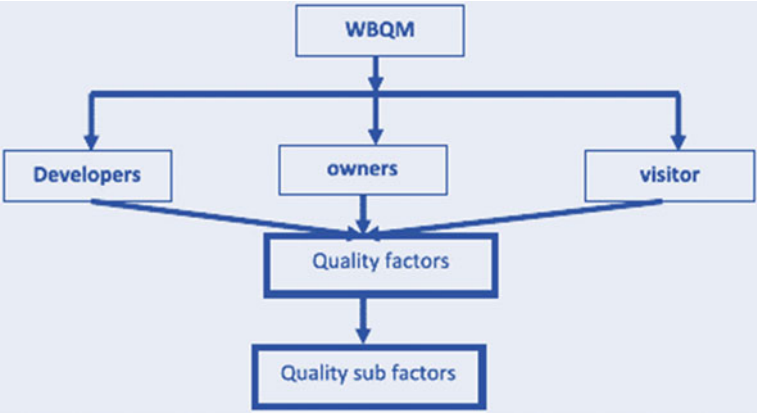

Fig. 2 Structure of WBA quality model. *Source* Yuhana et al. (2014)

Yuhana et al., (2014) publish a new AIS paper discussing the study of the usability function of the (IT'S ') system's management module as Academic Information to display academic data such as students, employees, classes, academic events, and information about the curriculum. Students, administration staff, faculty access this modularity feature, and department chairperson, some attributes generate a zero value like learnability.

This shows that the student administration module AIS is difficult to learn. Other sub-characteristics results have a non-zero value yet are not perfect.

The usability feature of the assessment is the lake of this study only as valuation instruments based on ISO/IEC 9126, whereas ISO/IEC 9126 has maximum measurement metrics. These overall results show that a technological acceleration and evolution in AIS is needed to boost the quality value and to be real.

Tabrizi et al., (2017) have conducted a study at their university to determine the usability of their systems derived from the Near East University (NEU) SIS's ISO/IEC 9126 (Understandability, Learnability, Operability, Attractiveness, and Compliance) because the ISO/IEC 9126 model has the most suitable metrics for assessing the internal usability of the systems. According to the developers, when considering development opportunities for potential iterations of the framework, the outcome of this research would be useful for the (NEU SIS) developer team.

One of the solutions that offer management facilities for educational and academic aspects is a Student Information System (SIS). All university students must log into the "Einstein System", as well as all levels of academic staff and university stakeholders, to access the system processes; as e-learning systems, it can be viewed as a robust academic system.

The study results revealed that the understandability of the system achieved the optimum value. The learnability sub-characteristic results indicate that the system is sufficiently learnable, Operability as an important sub-characteristic of the system yielded an acceptable result, Attractiveness and Usability compliance results were

not perfect, which means that the attractiveness sub-characteristic reveals that the Einstein system interface needs to focus on improving the interface design of the system.

Uppal et al., (2018) proposed an E-Learning Quality Model (ELQ), consisting of three dimensions:

- Service Dimension (Responsiveness, Reliability, Tangibility, Assurance, and Empathy)
- Learning Contents
- Course Web.

We noted that it is important to achieve the overall impression of good E-Learning systems in addition to service consideration of information system quality. The data analysis results show that "Assurance, Tangibility, Responsiveness, Course Website and Learning Contents" have a positive association with the perception of (ELQ), students of E-Learning prefer a safe and simple E-Learning environment but do not perceive it. Understanding and reliability as the significant perception of ELQ.

Almarabeh et al., (2014) to determine the impact of the E-Learning Management System in the University of Jordan conducted another study. They surveyed students' opinions about this new educational system and addressed the challenges that students faced while using the E-Learning Management System.

The University of Jordan is attempting to employ Information and Communication Technology (ICT) in education and is progressing by implementing the latest version of E-Learning Management Systems (LMS) to stay up with the technological change in higher education, according to their report. The university uses the E-Learning framework, which was adapted from Khan's three-part structure, see Fig. 3.

Other issues that students have when utilizing the E-Learning System at the University of Jordan were uncovered in this study, including hardware resources and the university network. Other challenges students face include difficulty in seeking

Fig. 3 Khan's E-learning framework. *Source* Almarabeh et al. (2014)

assistance with Moodle or resolving technical issues, such as learning a course from a computer screen.

Gürkut and Nat (2017) describe the Student Information System (SIS) as one of the primary systems for promoting the management and growth of higher education institutions (HEI).

The teacher to upload course material to students uses the SIS, students to register for online classes, review their schedule, test schedules, grades, and other activities use the SIS. The purpose of this study is to determine the impact of information system consistency on the satisfaction of SIS academic and administrative employees. They announced that System Consistency is one of the metrics for the software and hardware of the information processing system.

Al-Adwan et al., (2018b) publish his paper about the Jordanian universities on the advancement of E-learning in higher education systems. His research was aimed at evaluating the capacity of both Al-Zytonah University and Applied Science University students and staff to participate effectively in the E-Learning Systems Model.

They strongly believe that oral communication plays an important influence on Jordanian culture and education. Lecturers in this group strongly believed that oral communication is the most expressive way to deliver information to students.

The conclusion of the study has shown that full-time faculty members and students are not ready to get involved in E-Learning programs at (research time); many issues must be addressed according to their technological readiness and their attitudes before implementing E-Learning programs. This research varies from my research on the evolution of the E-learning System in the Jordanian universities' higher education systems. Our analysis on how to use the latest models of the software quality and our enhanced model of the framework in the E-Learning System using HEI, but the two studies complete each other in serving the end-users.

Cho et al., (2009) have conducted a study to look into the elements that influence how students use and behave with e-learning technologies. Their study explores the impact of performance expectancy, effort expectancy, hedonic motivation, habit, social influence, and trust on students' behavioral intentions, based on the TAM and UTAM's strong theoretical foundations and employing structural equation modeling (SEM) using AMOS 20.0.

However, behavioral intention and facilitating conditions accounted for 40% of the total, with significant favorable effects on students' e-learning system use behavior. On the other hand, both effort expectations and social influence had little effect on students' behavioral intentions.

A framework was proposed by Almajali (2016) to develop a theoretical framework toward e-learning adoption in Jordanian public and private universities through conducting a comprehensive review of literature, empirical studies and a survey questionnaire that will be distributed to a selected sample study on the students. Based on the technology acceptance model, the researchers developed a model designed to measure the impact of ease of use, perceived usefulness, and training on e-learning usage on the actual use of e-learning systems via the initial trend towards the use

of e-learning systems and the intention towards the use of e-learning systems as mediating factors.

It focused on the way teachers interact with e-learning systems, where it discussed the issue within the obstacles and negatives that affected the interaction of students and teachers with e-learning systems.

In a study conducted by Tarhini et al. (2017), a conceptual framework was constructed by combining two more components, trust and self-efficacy, into the unified theory of technology adoption and usage (performance expectancy, effort expectancy, hedonic motivation, habit, social influence, price value, and facilitating conditions).

The findings revealed that, in order of influence, performance expectancy, social influence, habit, hedonic motivation, self-efficacy, effort expectancy, and trust strongly influenced behavioral intention and explained 70.6 percent of the variance in behavioral intention. Contrary to popular belief, enabling conditions and economic value had little effect on behavioral intention. The following characteristics are thought to be important in understanding technology adoption, but to the best of the authors' knowledge, no study has modeled all of these elements together.

As a result, by incorporating all of these variables and being the first to be tested in UK institutions, this study will contribute to the literature on social networking adoption.

Al Kurdi et al., (2020a) have conducted a study at higher educational institutes in the UAE.

The study involved a sample of 365 university students. To describe the acceptance process, the structural equation modeling (SEM) method was used. Based on the Technology Acceptance Model (TAM), the standard structural model that involves e learning, computer self-efficacy, social influence, and enjoyment, was developed. Computer Anxiety, Technical Support, Perceived Usefulness, Perceived Ease of Use, Attitude, and Behavioral Intention to Use e Learning were also developed.

The findings showed that TAM served as a suitable theoretical tool to comprehend the acceptance of e-learning by users. The most crucial construct to explain the causal process employed in the model was e-learning. Computer Self-Efficacy, Social Influence, Enjoyment, System Interactivity, Computer Anxiety, Technical Support, Perceived Usefulness, Perceived Ease of Attitude, followed by behavioral intention to use e-learning Practical implications.

Al Kurdi et al. (2020b) The goal of the study is to figure out what factors influence students' acceptance of e learning and how these aspects influence students' intention to use it. Based on the technological acceptance paradigm, a theoretical framework was created (TAM).

"Social influence, perceived enjoyment, self-efficacy, perceived usefulness, and perceived ease of use" were found to be the greatest and most important indicators of students' intention to utilize and attitudes toward e-learning systems.

The findings have practical significance for practitioners, legislators, and developers in the implementation of effective E-learning systems to improve university students' continued interests and activities in a virtual E-learning environment. The

research findings provide useful recommendations for E-learning practices, which may turn out to be guides for the efficient design of E-learning systems.

The following steps are carried out to use the AHP approach in deciding the goals between various criteria:

Step 1: Decision-makers first use the AHP to break down their decision problem into multiple levels of sub-problems that are more easily evaluated and each of them can be independently analyzed.

Step 2: The target is at the top level of the root hierarchy; the hierarchy's elements can contribute to all aspects of the problem of decision.

Step 3: Identify alternatives to reach the goal.

The next level of the hierarchy contains the criteria. In Fig. 4, there are no criteria the decision-makers have determined to be important in reaching the goal. The last level of the hierarchy contains the alternatives, there are three alternatives considered in achieving the goal.

Step 4: Identify the evaluation criteria for alternatives.

In Fig. 4, the lines connecting each alternative to each criterion show how each alternative is evaluated according to each condition.

The evaluation is performed during the pairwise comparison process, described in step. The number of comparisons required to calculate priorities for a matrix of N elements is ((N2 − N)/2). The number of comparisons quadratically increases with a number of alternatives. At some point, AHP is no longer practical for large, if the decision-making problem consists of N criteria and alternatives; the decision matrix takes the form (Fig. 5).

Step 5: After the (AHP) method has been formed, a set of two pairwise comparisons are accomplished. The first set of pairwise comparisons is among the pairs of criteria

Fig. 4 AHP hierarchy

Fig. 5 Decision matrix

$$D = \begin{bmatrix} d_{11} & d_{12} & \ldots. & d_{1n} \\ d_{21} & d_{22} & \ldots. & d_{2n} \\ . & & & \\ . & & & \\ . & & & \\ d_{m1} & d_{m2} & \ldots. & d_{mn} \end{bmatrix}$$

and the second set is between the pairs of alternatives. During the pairwise comparison process for the criteria, the researcher performing the comparisons assigns a relative importance weight to each criterion in the comparison (Fig. 6).

The importance of weight is evaluated in terms of the criterion's importance in reaching the goal. Criteria with an enormous impact on achieving the goal should receive higher importance weights than those with less of an impact. A scale frequently used is the nine-point scale, see Table 1.

After the pairwise comparisons have been conducted for the criteria, the weights provided in the comparisons have been structured as a matrix.

Step 6: Obtain Local and Global priorities for each alternative, then the local priority is calculated using the following equation:

$$\begin{bmatrix} a_{11} & a_{12} & \ldots. & a_{1n} \\ a_{21} & a_{22} & \ldots. & a_{2n} \\ . & & & \\ . & & & \\ . & & & \\ a_{n1} & a_{n2} & \ldots. & a_{nn} \\ & & . & \end{bmatrix} = \begin{bmatrix} w_1/w_1 & w_1/w_2 & \ldots. & w_1/w_n \\ w_2/w_1 & w_2/w_2 & \ldots. & w_2/w_n \\ . & & & \\ . & & & \\ . & & & \\ w_n/w_1 & w_n/w_2 & \ldots. & w_n/w_n \end{bmatrix}$$

Fig. 6 Decision matrix and pair comparison matrix

Table 1 Scale of relative importance

Intensity of importance	Definition
1	Equal importance
3	Moderate Importance
5	Strong Importance
7	Very strong importance
9	Extreme of Importance
2, 4, 6, 8	Compromise between values

$$LP_i = \frac{\sum_{j=1}^{N} (RW_{ij})}{\sum_{i=1}^{N} \sum_{j=1}^{N} (RW_{ij})} \tag{1}$$

Alternatives, in which M is called alternative number and N is the criteria number. This equation then measures global priority or global weight (Aguarón et al., 2019), If (LPi) is a local priority criterion (I), (RWij) is criterion (I) relative to criterion (J), and (N) is criteria number (N) (Schwester, 2009).

To calculate the local priority for each alternative for each criterion, pair-wise comparisons are also performed. Local preference for alternatives uses the same equation as the criterion for local priority. The alternative, which complies more strongly with the comparison criterion,

Receipts have a higher weight. If an AHP hierarchy includes a criterion, the alternatives will have a comparison matrix. An (M × N) matrix builds criteria and criteria from local priorities.

$$GP_k = \sum_{j=1}^{N} (LPA_{kj}) \times (LP_j) \tag{2}$$

where GP_k is an alternative k's overall priority (n is criteria number) (LPA K_i) is an alternative K's local priority where ($1 \leq K \leq M$) and (j), and (LP_i) is a local criterion priority (j).

Using the global priority, the decision-maker determines which alternative should be selected; the alternative to the highest global weight is the best one. The eigenvectors of this matrix must be calculated, which would give the relative weights of the criteria. The relative weights obtained in the fourth step should satisfy the formula:

$$\lambda_{max} = \boldsymbol{A} \times \boldsymbol{W} \tag{3}$$

where (A) is the matrix of the pairwise, (W) is the weight and μmax is the higher values of its own (Rawashdeh & Matalkah, 2006). If the hierarchy level has attributes upwards, the weight vector has been determined by multiplying each factor by the parent at a higher level. If the hierarchy is up, this method continues until the height of the hierarchy is approaching, and the best choice is to take the alternative to the highest coefficient weight.

Step 7: Then determined by the AHP to represent the accuracy of the decisions of the decision-maker during the assessment period. The (C.R) consistency ratio, the estimate was rendered as follows both in the decision matrix and in the pairing matrix:

$$C \cdot I = \lambda_{\max} - \frac{n}{n-1}$$
$$C \cdot R = \frac{C \cdot I}{R \cdot I} \tag{4}$$

where μmax represents the highest value on its own (explained in step 6 above). N represents several parameters, the greater the consistency if the consistency index is near zero to consider the AHP findings as consistent, the accuracy ratio should be lower than or equal to (0.10). If not, the decision-maker should return to steps three and four and make a further review and estimate.

Step 8: The number of the consistent column entries must therefore divide each factor. A uniform matrix in which all elements vector is summed up is obtained.

6 Structuring the Hierarchy for the Novel Model

This section formulates the appropriate hierarchy with the assistance of the enhanced model (Al_Nawaiseh, et al., 2020a) The hierarchy is expressed in a tabular format reflecting the four levels (Level 0 to Level 3) shown in Table 2. Such structuring makes the new model applies to the AHP process.

- The goal is to evaluate the Academic System (E-Learning System) according to our new model that meets end-user requirements, herein the goal is placed at the top level of the hierarchy (Level-0).
- The six main characteristics were identified to achieve our goal (Level 1).
- The sub-characteristics (Level 2) decompose the main characterizes of System Contents Quality in E-Learning (Level 1) into System Oriented Domain, On-line Services, and Content Quality.
- The Attributes (Level 4) consist of thirty-nine attributes, as listed in Table 2 and grouped in several subsets, each corresponding to one of the nineteen sub-characteristics.

6.1 Evaluate System Content's Quality in E-learning System

To strengthen our model, we added a new character, system content quality, which has four sub-characters: system domain, online services, and content quality with their attributes. The term "content quality" refers to the quality of a system used to display

Table 2 New proposed model (ESQE)

Goal (level-0)	Characteristics (level-1)	Sub-characteristics (level-2)	Attributes (level-3)
Choosing the best academic system	Functionality	Interoperability	Platform compatibility Data compatibility
		Sustainability	Application- domain Function specification changes
		Compliance	Standardization
		Security	Privacy Authentication
	Reliability	Recoverability	Time to recover Error reporting
		Availability	Planned down time
		Maturity	Fault tolerance evolvability
	Usability	Operability	Effort of operating Administrability
		Understandability	Documentation Training User support
		Learnability	Time to use Time to configure
		User interface	Consistency Simplicity User control
	Efficiency	Time behavior	Response time Scalability
		Resource behavior	Memory utilization Disk utilisation
	Maintainability	Changeability Testability Upgrading	Customizability Portability Self-test Test site Easy to upgrade
	System content's quality	System oriented domain	Content relevancy Student service information
		On-line services	Online assessment FTP service Connectively
		Content quality	Up to date content Content design Accessibility

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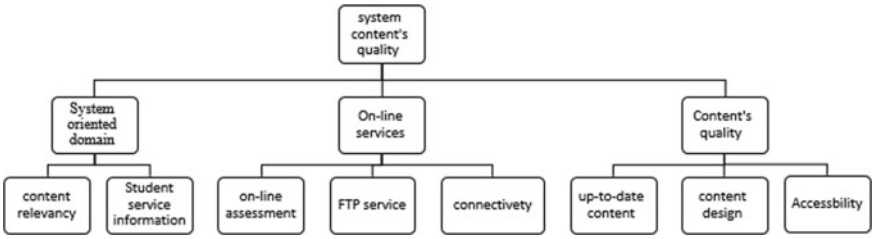

Fig. 7 System content's quality in ESQE

and layout information, as well as the presence of technological characteristics that influence students' perceptions of the system platform with online learning (Fig. 7).

The following are the sub characteristics of system content quality with their respective attributes that were used as a contribution to this study.

1. **Student Oriented Domain**: Academic system services tailored specifically to students, to assist them in their all-academic activities during their study years.

   - **Accessibility**: characterize is defined by Alkhattabi et al. (2010) as the quality features concerned with accessing distributed information. They believe relevancy to be a sub-attribute of accessibility, measured through sub-attributes such as response time and availability. The system in our approach provides relevant content that allows students or instructors to be informed. Correctly, to their right information is extracted from another system such as enrollment, academic degrees, and research.

     Student Services Information: This refers to how the system offers academic and service information to students, such as housing, healthcare, scholarships, and so on, and how it interfaces with other systems.

2. **On-Line Services**: Refers to any information and services provided over the Internet, for instance, enrollment, grades, fees, web services such as FTP, newsgroup, chatting, assessment…etc.

   Online Assessment: The system provides an online grading facility for E Exams and assignments, which sends the grade to students and instructors immediately after the attempt is completed.

3. **Content's Quality**: "Learning Contents" as implemented Combination of "Information" and "Course Website" to construct the entire framework. As up-to-date content in our enhancement model, "Learning Content" applies to all course materials, univ announcements, quizzes, and registered virtual classes in the current job. Factors of "learning material" were taken from previous research, mainly (Alla et al., 2013; Barnard et al., 2017).

   - **FTP Service**: end-users can simply transmit and receive files (download and upload) across the E-Learning system using FTP (Uppal et al., 2018).
   - **Connectivity**: the students connect with the instructors easily with communication tools provide by the system forums, chat, and e-mail.

- **Up-to-Date Content**: To keep all academic content up-to-date, the framework website must be periodically updated in terms of semester material, which includes recorded lectures as videos or live lectures, and updated assignments.
- **Content Design**: Significant factors influencing the quality of content, (Etaati et al., 2011) have been grouped and cited about interface design. Cho et al., (2009), navigation, attractiveness, and ease of use. Students can attend class lectures, log in without assistance to course websites, assuming the websites of the course are configured to be open and easy to reach, including adaptive screen reading and magnification control applications (Al_Nawaiseh et al., 2020b; Cidral et al., 2018)
- **Accessibility**: It defines access using distributions or measurements by sub-attributes to information or websites (relevancy, response time, and availability).

In this paper, accessibility refers to how end-users and developers can readily access their E-learning accounts using a variety of devices such as a computer, laptop, tablet, or mobile phone, and they can access the website most of the time.

Then, following the normal AHP approach, these additional characters will be evaluated by pairwise comparison of criteria and alternatives.

Using Saaty's scaling-table, the AHP six steps and the collected data from the questionnaire, the mean of responders' answers are described relative to the importance of characters to each other. As an Arithmetic mean value of all responses, a weight value was assigned to each of the characteristics: Functionality, Reliability, Usability, Efficiency, Maintainability, and system contents quality.

6.2 Weights Values Matrix for Mu'tah University as Case Study

Since its launch in 1993, the Computer Center has been considered the electronic portal of the University of Mutah, which would support all electronic services for students and workers at the university.

The Department of Publishing and E-Learning was established in 2008 to oversee the E-Learning website in terms of working on managing computerized exams, monitoring their progress and publishing electronic content related to materials for students, and providing protection and security for E-Learning data and recently. Later the University launched Moodle App services with these application features:

- Easily access course content even when offline, Connect with course participants.
- Keep up to date—receive instant notifications of messages and other events, Assignments, and Homeworks Submissions.
- Track student's progress -View the grades, check completion progress in courses and browse the learning plans.

- Complete activities anywhere, anytime—attempt quizzes, post in forums. Here are the pairwise comparison judgments for all E-Learning software attributes that have been evaluated by end-users.

6.3 Constructing the Weight Values Matrix for Sub-characteristics and Attributes for System Content Quality in Mu'tah University

This table describes responder's answers average relative to the importance of characters to each other. To conduct the comparison Table of size N × N for n criteria, also called the priority Table, we must find the ranking of priorities, namely the Eigen Vector, by normalizing the column entries by dividing each entry by the sum of the column entries, and then take the overall row average to get Priority Weight to see table below (Tables 3, 4, 5, 6, 7 and 8).

Table 3 Weights values for the sub-characteristics according to system content's quality

System content's quality	Student oriented domain	Online services	Content quality
System oriented domain	1.000	3.000	9.000
Online services	0.333	1.000	4.000
Content quality	0.111	0.200	1.000
Sum	1.444	4.200	14.000

Table 4 Pairwise comparisons judgment for the sub-characteristics according to system content's quality

System content's quality	Student oriented domain	Online services	Content quality	Priority weights
Student domain	0.692	0.714	0.643	0.683
Online services	0.231	0.238	0.286	0.252
Content quality	0.077	0.048	0.071	0.062
C.R = 0.01				∑Priority weights = 1

Table 5 Weights values for the attributes according to student oriented do main

Student oriented domain	Content relevancy	Student's services
Content relevancy	1.000	2.000
Student's services	0.500	1.000
Sum	1.500	3.000

Table 6 Weights values for the attributes according to online services

Online services	Online assessment	FTP services	Connectivity
Online assessment	1.000	3.000	3.000
FTP service	0.333	1.000	1.000
Connectivity	0.333	7.340	1.000
Sum	1.667	11.340	5.000

Table 7 Pairwise comparisons judgment for the attributes according to online services

Online services	Online assessment	FTP service	Connectivity	Priority weights
Online assessment	0.600	0.265	0.600	0.488
FTP service	0.200	0.088	0.200	0.163
Connectivity	0.200	0.647	0.200	0.349
C.R = 0				$\sum$Priority weights = 1

Table 8 Weights values for the attributes according to content quality

Content quality	Up to date	Content design	Accessibility
Up to date content	1.000	2.000	1.000
Content design	0.500	1.000	0.333
Accessibility	1.000	3.000	1.000
Sum	2.500	6.000	2.333

6.4 Checking for Consistency

The next step is to calculate a Consistency Ratio (CR) to measure how consistent judgments have been relative to large samples of purely random judgments. To verify the consistency of the comparison table, Cho et al., (2009) proposed a Consistency Index (CI) and Consistency Ratio (CR) and should satisfy the condition of CR < = 0.1 Where CR is the average consistency index.

Table 9 Random consistency index

N	1	2	3	4	5	6	7	8	9	10
R.I	0	0	0.52	0.88	1.11	1.25	1.35	1.40	1.45	1.49

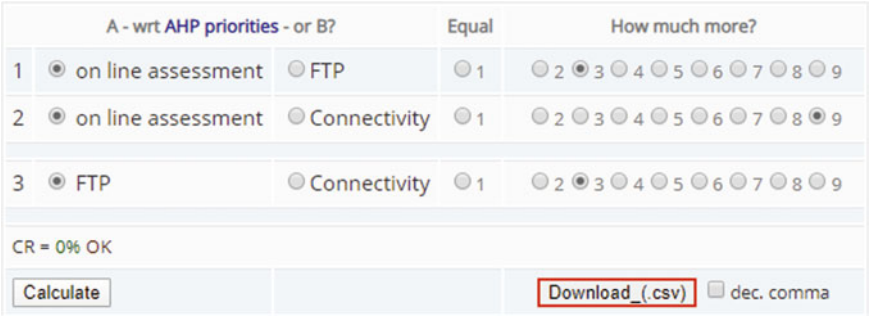

Fig. 8 AHP priority calculator

C.R = C.I / R.I where R.I is the Random Index whose value depends on N (Table 9).

Consistency Index (C.I) = $((\lambda)_{max} - N)/N - 1$ where n is the compared elements. If the C.R is > 0.1 the judgments are untrustworthy because it is too close for comfort to randomness and the evaluation test is valueless must be repeated. Here is the consistency ratio is obtained by a free web-based AHP solution, the AHP priority calculator (Fig. 8).

The corresponding matrices for the sub-characteristics are constructed and shown below in Table 10, following the same procedures applied to the Characteristics, it's may notice that attributes are compared to itself because it is single sub-characteristic, therefore, the assigned priority value is one.

7 Results and Discussion

Table 10 presents all the calculations. It could be seen that the eigenvector of relative importance or in the other words the weights of the sub characteristics as the following:

- Student-oriented domain (0.753).
- On-Line Services (0.231).
- Content Quality (0.62).

Therefore, from students' and academicians' perspectives, the Student Oriented Domain of the E-learning system is the most important one in the other three Characteristics, followed by On-Line Services and Content Quality.

Table 10 Global weights for each characteristic in contents' quality in Mu'tah university

Characteristics (level-1)	Local weight	Sub characteristics (level-2)	Local weight	Attributes (level-3)	Local weight	Global weight
System content quality	0.316	Student oriented domain	0.753	Content relevancy	0.667	0.1587
				Student service information	0.333	0.0792
		On-line services	0.093	On-line assessment	0.488	0.0143
				FTP service	0.163	0.0047
				Connectivity	0.349	0.0102
		Content quality	0.622	Up to date content	0.321	0.0630
				Content design	0.225	0.0442
				Accessibility	0.454	0.0892
$\sum$ Global Weight = 1						

Honestly, the results were expected because the Academic system services are geared specifically to the students. To serve the students in their all-academic activities during their study years, so it must be oriented to the student and their instructors, this sub-character has the high eigenvectors or high priority weight; these services can be measured by their attributes and their priority weights.

- Content Relevance (0.667) and Student Service Information (0.333). It was clear from the evaluation of students and teachers of this feature that Contents Relevancy more important than sharing information with other systems such as registration information, grades information, payment, and university housing information and the consents relevancy gain a high score in user's view.
- From an educational perspective, the students consider the most vital aspects of an E-learning system is On-Line Assessment with priority weight (0.488), FTP Service (0.163), and Connectivity (0.349).
- The results revealed that On-Line Assessment achieved the optimum value corresponding to students. On-Line Assessment, what matters most to students and teachers in academic systems is the system of exams and scores especially now in Covid_19. Therefore, systems developers must improve and develop some services that are accurate and available to students especially now in COVID-19 Epidemic. That allows them to review their exam performance and to teachers improve their skills in assessing students fairly.
- secondly Connectivity (0.349) is a fetal service to students, to connect with their teachers and with each other's, to share materials and information, this feature requires a continuous uninterrupted network to enable students to continue communicating between each other and their teachers.

- According to respondents file transfer protocol FTP (0.163) is not an important service to students, they download course materials, upload Assignments, video and attach files to their teachers alas, it has a low score in this evaluation.
- Finally, the last three attributes Up-to-Date Contents (0.321), Content's Design (0.225), and Accessibility (0.454) are associated to achieve the sub-characterized Content's Quality.
- The most important one is Accessibility to E-learning, which means how the student can access correctly to their session? In addition, easy to access E-Learning through many devices PCs, laptops, Tablet, and Mobile phones, most academic systems and academic webs achieve this attribute.
- Secondly Up to Date Contents, in COVID-19 Epidemic the contents must be updated daily, while the students are not in camps.
- Then E-learning system design, the team needs to focus on improving the design of the content of the system, considering the design of contents, like elements, organized attractively and consistent, multimedia elements must be arranged in a consistently manner.
- AHP process has been applied to calculate eigenvectors and eigenvalue of sub-characteristics of quality characteristics of the target system.
- Therefore, this empirical study provides high institutes with the quality characteristics and their importance that should be taken into account in developing implementing their E-learning system. In which it can be assured that the E-learning Systems will be successfully implemented.

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Obstacles to Applying the E-Learning Management System (Blackboard) Among Saudi University Students (In the College of Applied Sciences and the College of Sciences and Human Studies)

Saddam Rateb Darawsheh, Muhammad Alshurideh, Anwar Saud Al-Shaar, Refka Makram Megli Barsom, Amira Mansour Elsayed, and Reham Abdullah Abd Alhameed Ghanem

Abstract The study aimed to identify the Obstacles to the implementation of applying the e-learning management system (Blackboard) among Saudi university students. To achieve the objectives of the study, the researcher adopted the descriptive approach. The study sample which was chosen randomly consisted of (250) female students from the College of Applied Sciences and the College of Sciences

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_21

and Humanities at Imam Abdul Rahman bin Faisal University IAU. The researcher built the study tool "questionnaire" which covers four areas: Administrative barriers, technological barriers, financial (physical) barriers, and social barriers. The data was processed by the statistical method. The findings indicated that the areas of the barriers which face the implementation of the blackboard system among female students at the College of Applied Sciences and the College of Sciences and Humanities at IAU were as follows: Social barriers which ranked first and with a (high degree) followed by financial barriers (moderate degree), administrative barriers (moderate degree) and the technical barriers (low degree) and with the mean 2.60, 2.20, 2.13 and 1.37 respectively. The study recommended promoting the technical aspect in the university through using the blackboard system and providing specialists and technicians with suitable training regarding the use of this system and holding educational sessions for students and the College of Applied Sciences and the College of Sciences and Humanities members to enhance the concept of e-learning.

Keywords Barriers · E-Learning · Blackboard system

1 Introduction

Universities play a significant role in the education process. However, today they face many demands that are imposed on them by the rapid scientific and technological developments despite the limited potential and resources available to them. With the increasing demand for university education, they were keen to raise the level of the effectiveness and quality of education they provide to cope with the requirements of the current era and meet the needs of the labour market (Alshurideh et al., 2021; Kurdi et al., 2020). Therefore they sought to develop their development plans and human cadres to achieve the effectiveness of education in it in line with developments since the university education system must not be limited to the traditional method of teaching in the classroom (Alshurideh et al., 2019a, b; Iskandar, 2019), but rather modern developments in communication technology must be employed and used to provide education that its curricula reach university students in any time and any place, and they provide an opportunity to increase the absorptive capacity of universities for new students and to develop their competencies (; Alsharari & Alshurideh, 2020), skills that are necessary for achieving their success of individuals in social and professional life in the era of the knowledge revolution effectively (Alkmaishi, 2017; Al-Maroof et al., 2021a, b). Educators seek to benefit from the all-new available methods and find modern concepts consistent with scientific and knowledge development (Ghayad, 2016; Leo et al., 2021; Yasin, 2011). Global, Arab, and local interest in technology and technology implementation in education have increased in the light of developments in the fields of technology, communication, and invention accompanying the development of technological concepts and terminology in all disciplines.

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The Ministry of Education in Saudi Arabia, especially universities, has started using the Learning Management System, known as the E-Learning Portal (Eduwave), which is one of the technological means in the educational communication process. Babu and Sridevi, (2018) and Al-Hamad et al. (2021) see that e-learning is important for education because it can improve the quality of the learning experience and extend the reach of every lecturer and tutor. It can help remove barriers to achievement, by providing new and creative ways of motivating and engaging pupils and learners of all abilities, enabling, and inspiring everyone to attain their educational potential (Al Kurdi et al., 2020; Amarneh et al., 2021). Where the use of these technological media as seen by (Zboun, 2015) contributes to raising the level of the teaching and learning process, and it helps to break out of the traditional education that is based on indoctrination, information preservation, and retrieval, to the interactive learning that leads to exploration, research, analysis, and explanation and enhances problem-solving skills (Alshurideh et al., 2019a, b; Bettayeb et al., 2020). This system has become one of the most prominent e-learning projects adopted by the Ministry and it aims to develop the teaching and learning processes as well as the educational outcomes (Akour et al., 2021; Tawfiq, 2010). Due to the importance of this method in the education process, many Arab and foreign countries have adopted it and started using the e-learning system in their universities (Saidi, 2016), taking advantage of Saudi expertise in the field of e-learning (Alhamad et al., 2021; Alshurideh et al., 2020). The use of the Saudi e-learning portal puts Saudi Arabia at the forefront of the Arab countries that employ technology in education, which contributes to improving the outputs of the educational process in Saudi universities, and makes Saudi Arabia one of the developed, modern, and exporting countries of distinguished human competencies, able to compete regionally and globally (Bedawi, 2017). The educational system has faced many academic, educational, social, and economic problems, and the most important of these problems is how to communicate with students, especially in the circumstances of the outbreak of the Corona pandemic which disrupted traditional education and call for shifting to e-learning (Alshurideh et al., 2021; Harahsheh et al., 2021). This kind of education is an integrated educational system consisting of the teacher, the student, the curriculum, the support, the Internet, and the material and social factors, all of which affect the virtual learning process (Ashal et al., 2021; Hamad, 2018). The interface of e-learning has many barriers, especially in universities, including administrative, technical, financial, and social barriers that hinder students' access to the required information, their academic courses, the Internet, a faculty member, and the university system (Alshurideh, 2014; Alshurideh et al., 2015). Therefore, the researcher has sought to examine and identify the barriers that hinder the implementation of the Blackboard System for female students at the Community College at Imam Abdul Rahman bin Faisal University.

1.1 Study Problems and Questions

The use of an e-learning portal such as BlackBerry in the learning process has exposed many issues, such as the gap in the ability of teachers to deal effectively with computerized curricula (Hayyani, 2019) and the weakness of technology infrastructure in universities, whether in the field of e-learning or the field of education administration, in addition to that faculty members do not make adequate use of the capabilities available in the e-learning portal. Bearing in mind the crucial role that faculty members play in the teaching and learning process and the importance of paying attention to the factors concerning them when preparing any educational development project in general, this study will be conducted to identify the barriers that hinder the use of the e-learning platform (Blackboard) from the female students' viewpoint in the community college. As a result of advances in the field of information and communication technology, the need to incorporate this technology in the field of education has arisen to create a generation capable of coping with this modern era, thus, educational institutions have faced more pressure to apply e-learning system especially because of the breakout of coronavirus and universities closure. During his work at IAU the College of Applied Sciences and the College of Sciences and Humanities, the researcher noted that students face some challenges in using the Blackboard e-learning management system, and in the light of the above, the study issue lies in trying to address the following key study question: What are the barriers faced by female College of Applied and the College of Sciences and Human students at Imam Abdul Rahman bin Faisal University when using the (blackboard) system. The following sub-questions stem from this question:

1. What are the administrative barriers that face female students applying to the e-learning management system (Blackboard) in Saudi universities students?
2. What are the technical, financial, and social barriers that female students at the College of Applied Sciences and the College of Sciences and Humanities at IAU face during using the Blackboard System?

1.2 The Importance of the Study

The importance of the study lies in the topic it covers at a time the world is focusing on employing modern technology in all its forms, integrating e-learning in the educational process, and providing systems for managing this important type of education to create a means of communication that is accessible and can be effectively used by the learner and the faculty member to achieve the desired learning. Therefore, it is necessary to identify the barriers facing students in using these systems to provide decision-makers at the university with information about these obstacles, in addition to the possibility to benefit from the results in other colleges and universities.

1.3 Study Objectives

The study aims to identify the barriers that face female students at the College of Applied Sciences and the College of Sciences and Humanities at IAU in using the blackboard e-learning management system and suggest some recommendations considering the results of the study.

1.4 Study Limits: The Study is Limited to the Following Limits

1. Time limits: in the second semester of the academic year 2019–2020
2. Spatial limits: the College of Applied Sciences and the College of Sciences and Humanities in Dammam and Jubail—(Imam Abdul Rahman bin Faisal University).
3. Objective Limits: Barriers to the implementation of the Blackboard System among female Students at the College of Applied Sciences and the College of Sciences and Humanities at IAU.
4. Human limits: Female students at the College of Applied Sciences and the College of Sciences and Humanities and those organized in the study.

1.5 Study Terms

Barriers: Procedurally in this study, is defined as a set of technical, material, administrative, and supervisory difficulties that prevent students from using e-learning in different educational situations.

E-learning: It is an innovative way to present an interactive, learner-centred, well-designed, pre-designed that is accessible environment by anyone, anywhere and anytime, using the Internet and digital technologies with educational design principles appropriate for open, flexible, and distributed learning environment (Badawi, 2015). Procedurally it is defined as an educational system in an interactive environment that the university provides to its students via electronic media, innovations, and virtual sessions.

The Blackboard System: It is an integrated system that manages the educational process synchronously and asynchronously, and provides a safe and easy-to-use environment, where faculty members upload their courses and lectures by adding multimedia (text, pictures, audio, video, graphics) in which learners meet to browse the content, each according to his needs, and communicate with each other through multiple communication tools (e-mail, forums) without being restricted by time and place factors, or through virtual classes that can be run from any type of smart device (Eryilmaz, 2015). Procedurally, it is an e-learning management system offered

to students at Imam Abdul Rahman bin Faisal University (Community College), through which e-courses and interactive electronic applications are provided.

Female the College of Applied Sciences and the College of Sciences and Humanities: Female students enrolled in the College of Applied Sciences and the College of Sciences and Humanities at IAU in Saudi Arabia, for the academic year 2021/2022, and those who study in the College of Applied Sciences and the in the three departments: Administrative Sciences Department and, Financial Sciences Department, and Computer Science Department at Dammam Campus. And College of Sciences and Human Kindergarten undergraduate Students Department Jabil.

2 Literature Review

2.1 The Concept of E-Learning

E-learning is defined by Khalifa (2011) as the employment of electronic and computerized media in the process of transferring and communicating information (Abadi, 2014) and as a method of teaching or training that enables the learner to obtain education or application at anytime and anywhere in the world through Interactive communication and information technologies in a synchronized manner in the classroom and an asynchronous remote manner, depending on self-education and interaction between the teacher and the learner. Khalifa (2011) believes that e-learning is an interactive system that relies on an integrated digital environment and aims to build curricula in an ideal manner that is accessible by employing digital programs and applications that provide an ideal environment for integrating text with sound and image and offers the possibility of enriching information through links to information sources on various sites and e-libraries. Abadi (2014) believes that e-learning is a method that does not require the physical presence of the teacher and the student in the classroom, where they can interact remotely in a way that eliminates the place and time aspect. E-learning also was defined as using the Internet and digital technology to create an experience and education for learners (Mubark, 2018). Based on the foregoing, we conclude that all definitions considered e-learning as a method of learning that is achieved by employing communication networks and the Internet, where the information reaches recipients in all places and times. E-learning is a modern method that relies on digital technologies (the Internet, computers, electronic library, e-book, etc.) to deliver information without the physical presence of the teacher and the student in the classroom.

2.2 E-Learning Types

Different types of e-learning are represented in the following:

1. Synchronous Online Learning: It enables groups of students to participate in a learning activity together at the same time, from any place in the world (Ashi, 2017) and it involves teacher-students or students-students online chats and videoconferencing (Ibn Ishi and Ibn Ishi, 2018).
2. Asynchronous Online Learning: According to Soman (2011) it is online learning where students study independently at different times and locations from each other, without real-time communication taking place. And it is more student-centred learning where students determine the time and place of learning, and it is done through utilizing digital learning and applications or email. We believe that the World Wide Web combined Synchronous education with Asynchronous education, by storing lessons and courses so that the learners can use them at the appropriate time (Shehri, 2010).
3. Blended Learning: Blended learning includes many learning tools, such as online collaborative learning software, and online-based courses. A pragmatic definition of Blended Learning was proposed by (Blieck & Brussel, 2011): "a good blend is a mix of study materials, work forms and learning activities that contribute to the realization of the objectives, which motivate and challenge the students to show the best of themselves."

2.3 Obstacles to Applying E-Learning

Several obstacles hinder the employment of e-learning such as:

1. Technical obstacles: Scholtz (2015) revealed that the most prominently perceived barriers to e-learning include the personal sacrifice of time required, Internet speed, and the lack of on-demand assistance available when learning through the use of electronic media in isolation. The weak technical infrastructure necessary for the application of e-learning and the lack of a high-capacity network to ensure the speed down loading educational curricula and software that provides applications for this type of education leads to limiting the spread of e-learning and the difficulty of its application in educational fields (Kumpikaite & Duoba, 2012).
2. Financial obstacles: Financial obstacles also contribute to limiting the application of e-learning. learners need to have sufficient experience in using computers and the Internet platforms, and if they do not have this ability (Aggarwal, 2009) then, the educational institution has to bear the costs of involving students in training programs regarding access to e-learning platforms and e-learning applications. Also, the limited coverage of the Internet, its relative slowness, and its high price have a significant impact on not employing this type of education (Alberdi et al., 2012).
3. Human and administrative obstacles: Different human and administrative barriers limited the application of e-learning such as the failure to consider the staff

competencies when applying e-learning in the educational institution (Ahmadpour & Mirdamadi, 2010) and the lack of technical, educational, and administrative human cadres capable of advancing this type of education at the individual and community levels. And the lack of training courses offered by the educational institution for its staff and students, as there are few faculty members possessing e-learning skills in an integrated manner. Some students may feel frustrated because they believe that e-learning is not important and that it has no value. Another fact is that some students underestimate e-learning and see it as an unprofessional way of learning due to the lack of direct supervision in teaching. In addition to the negative attitude of some faculty members toward e-learning (Naveed et al., 2017) and the overloaded burden assigned to the faculty members by the administration also plays a crucial role in hindering the application of e-learning.

2.4 Blackboard System

E-learning management system (Blackboard) is Web-based server software that provides a virtual interactive learning environment that maintains the learning process synchronously and asynchronously without the restrictions of time and place, as it offers a secure and easy-to-use learning environment in which faculty members present their courses and lectures by the use of text and images, audio, and video multimedia. It helps learners to understand better and allows interaction between the faculty and students through the application of various communication tools. The blackboard system helps to achieve high efficiency in education as this system supports the publication and presentation of courses, management of student records, follow-up activities, the possibility of communication between students and teachers through special dialogue forums, and the publication of tests, evaluation, and presentation of lectures (Badawi, 2015). In 2013, Imam Abdul Rahman bin Faisal University began training its faculty members to use the Blackboard system. The training was based on cooperation between the University Education Development Center and the Deanship of E-Learning and Distance Education to urge faculty members to use the Blackboard electronic learning management system and to integrate it with the traditional education methods so that it can be benefited from its advantages in different circumstances as nowadays the university has benefited from this system in promoting the teaching-learning process considering the outbreak of the novel coronavirus.

2.5 Advantages of the Blackboard Electronic Learning System

E-learning systems have different features and characteristics, but they share a range of significant advantages (Dasimani, 2017; Bunyan, 2019).

1. A graphic interface to facilitate dealing with it through pictures, menus, and changing colours according to the desire of the teacher and the learner.
2. Registration allows students to register for courses and follow up in detail.
3. Customization as this feature allows controlling the setting of the learning system interface and this feature is important because it suits a very large number of users, both following their preferences and what was presented.
4. Helping create and deliver content. Where the system provides an easy-to-use interface with examples and explanations to help users perform any of the required steps in the system.
5. Scheduling and content management, which means distributing course content over the weeks of the year, determining exam dates, and handing over costs according to a tight timeline.
6. Communication supports communication between the faculty member and the student by sending electronic messages, chat rooms, and forums.
7. Virtual Classrooms: The system allows for easy use of classrooms via the Internet.
8. Reports: where the system contains reports related to students' performance, grades, and ratings in educational activities and costs, and can be displayed in the form of files or graphs.
9. Tests and Assessments: These systems enable different numbers of tests by grading them in levels of ease and difficulty while adapting to the individual differences of students.
10. Certificates: The system enables a faculty member to print certificates for students in any form.
11. Mobile learning, as the system adds features that support the use of smart devices to make it easier for students.
12. Using the system as a tool for blended learning, allows the course to be managed through the Internet with the ability to manage it or parts of it traditionally and regularly.

The Blackboard system provides five main systems and solutions interconnected with each other to make education more effective (Huthaili, 2012; Yasin, 2011) which are:

1. Blackboard Learn: It provides the faculty member and the student with the ability to maintain education easily and in any place and time and to follow up on the results of choices and costs in a sequential manner.
2. Blackboard Collaborate: It is a virtual classroom that provides a remote communication service between faculty members and students using a virtual classroom environment and applications that enhance the learning process. process.

3. Blackboard Mobile: It is the use of smartphones and iPads in the teaching and learning process in any place, which gives them greater opportunity to review the entire scientific material.
4. Blackboard Analytics: It helps in assessing the performance of students and groups and analyzing the results to evaluate the educational process to help and make many decisions that improve performance and achieve the required quality of learning through the results.
5. Blackboard Connect: It is a mass notification system that lets students and faculty members send updates and emergency alerts to everyone in the group through emails, phone calls, text messages, or social media channels.

Studies are a basic and valuable guide for the researcher, as they provide him with the valuable information required for the subject of his study and help him to build appropriate study tools. Several studies concerning the subject of the current study have been selected, and the following is a summary of the most important studies.

Shehri (2010) conducted a study that aimed to identify the use of e-learning and training programs and the most important obstacles that limit the application of these programs. These results indicated that e-learning and training programs have become widely used, and there were major obstacles, the most important of which are the technical, human, and educational aspects. Where in Jordan, Soman (2011) identify the barriers to the use of the e-learning portal (EDUWAVE) from the point of view of teachers at Jordanian public schools in Amman and their attitudes towards it. The findings showed that the teachers are satisfied with the e-learning portal site in terms of its design and components. It also showed negative attitudes towards the use of the e-learning portal in the education administration. Huthaili (2012) conducted a study aimed at identifying the most important obstacles facing university e-learning in Yemen, and the results indicated that obstacles to university education include obstacles related to academics and learners, financial and technical obstacles, and barriers specific to society. In a study aimed at identifying the obstacles facing the application of e-learning through an analytical study et al.-Hadba University College conducted by Abadi (2014) showed that there are various obstacles to e-learning, which are the technical, financial, and human obstacles (Ashi, 2017). The study of Al-Qahtani (2014) conducted a study aimed at evaluating the experience of King Khalid University in using the blackboard e-learning management system from the point of view of the faculty member and students at King Khalid University. The study tool covered three domains (patterns of using the blackboard system, the attitudes towards using the blackboard system, and the obstacles to using the blackboard system). The study sample, which was chosen randomly, consisted of (312) faculty members and (846) students. The researchers used the descriptive method through a questionnaire to collect the required information. The results indicated that the faculty members and students use of the different styles of the blackboard system was of a moderate degree and that there were some barriers that faculty and students face in using the blackboard system, and the attitude of the study sample members towards using the blackboard system was neutral. The results also indicate that there were no statistically significant differences attributed to the variable of specialization

and training in using the blackboard system. The study recommended expanding the experience of King Khalid University by taking the viewpoints of students and faculty members, adding the standard of using the blackboard system to manage learning within the evaluation criteria of faculty members at King Khalid University. In addition to conducting a periodic survey of the training needs of faculty members from time to time to ensure that there are no needs that could impair the success of their teaching activities in various learning situations.

Ghayad (2016) conducted a study aimed at identifying e-learning as a strategic choice for Algerian universities, the results indicated the need to improve the efficiency and quality of universities, to benefit from the expertise and training of technicians and professionals in this field, and to benefit from the experiences of international countries in the field of e-learning and to overcome its obstacles. In 2017, Alkmaishi (2017) concluded the need to reform the educational system, especially e-learning because it faced various changes in its inputs and outputs and that the most obstacles it faces were the financial deficit. Also, in 2017, a study was conducted to identify the obstacles to using e-learning from the point of view of faculty members at Qassim University considering some variables. Bedawi (2017) built a questionnaire was prepared to collect data. The study found that the most prominent obstacles to using e-learning are the shortage of laboratories available to implement e-learning, the weak experience of the faculty member in using e-learning technology, the limited availability of technicians and specialists to solve technical problems. In addition to the fact that students lack motivation and direct support from the faculty member, and that the focus on the objectives of the online courses is not sufficient (Bedawi, 2017).

The study of Omar and Al-Masabi (2017) aimed to identify the effectiveness of using Blackboard Mobile Learn Application in developing the attitudes of female students at Najran University toward mobile e-learning and to check whether there were significant differences in learners' attitudes towards the use of the application due to the variables: (academic level, the skill of using electronic applications). It also sought to detect the most important obstacles facing students during the use of the application. The study was carried out on (26) female students in the fifth academic level who were enrolled in the "Computer in education" course. The experimental approach was used, the data collection tool was a questionnaire developed by researchers. The study findings indicated that students' attitudes were neutral in the pre-measurement, whereas they become positive in the post-measurement. The use of the Blackboard Mobile Learning Application was effective in developing students' attitudes towards Mobile Learning. Significant differences were noticed between the mean scores of participants in the pre-and post-measurement in favor of the post-measurement. The findings also revealed no significant differences among participants' attitudes towards Mobile Learning via the use of the Blackboard Mobile Learn application attributed to academic level and skill in using electronic applications. The effect of obstacles on the use of the application was moderate, and the most important obstacles were the difficulty of uploading files to the E-courses website and the difficulty of transferring and exchanging files among learners using smart devices.

Another study was conducted by Ashi (2017) to identify the importance of e-learning in achieving human development. The results indicated that developments in the fields of information and communication technology have made a qualitative leap or what is known as global transformations that have affected all educational processes, especially regarding teaching methods. It also indicated that e-learning becomes easy to employ and adapt to communications and information technology reduced social and cultural differences and overcomes the constraints of time and place and the scarcity of human resources. The methods of learning and e-learning also varied, and the need for future visions of the e-learning philosophy related to employing information and communication technology and its uses in all areas of the education system increased. Ruwaili (2018) conducted a study aimed at identifying the obstacles that face students at the College of Education at King Saud University in using the blackboard e-learning management system, and to achieve the objective of the study, the researcher used the quantitative descriptive approach and testing hypotheses and built a questionnaire to collect information. The study population consisted of all male students at the College of Education at King Saud University who were registered in the second semester of the year 1433–1432 AH. The findings showed that administrative obstacles were facing the students in using the blackboard e-learning management system, which came with a mean of (3.49 out of 5). In Dhali (2018) study which aimed to reveal the impediments to the use of e-learning from the point of view of faculty members of Najran University, the study sample consisted of (342) faculty members at 14 colleges of Najran University. The researcher adopted the descriptive method and to collect data, a questionnaire of 22 items was designed. The study results revealed impediments to a high degree regarding these problems: the difficulty of applying e-learning to some courses that require real observation, lack of encouraging incentives, lack of experience in using e-learning, lack of students' response to e-learning, ease of hacking into content and exams and students' lack of access to computer and internet. In addition to the poor internet service and less qualified technicians. Where the impediments to a moderate degree included insufficient counselling sessions and educational meetings, poor communication with students, lack of planning for simultaneous classes, and the difficulty of exam scoring and declaring results. Moreover, the paucity of specialists, poor technical support, and technical updates. Finally, the impediments of lower degree refer to extent of time and effort required for e-learning, lack of social perception towards it, and difficulty of dealing with it. On the other hand, no statistically significant differences were found regarding the variables of gender, educational qualification, and experience in the use of blackboards. The study Al Mubarak (2018) which aimed to identify the reality of applying e-learning in Sudanese universities in light of some recent trends of total quality, indicated that the application of comprehensive quality standards in e-learning available at the university came to a high degree and that the university's e-curriculum objectives consider comprehensive quality standards. It was of a high degree, and the evaluation in the university's electronic curriculum adheres to the comprehensive quality standards with a high mean.

Ibn Ishi and Ibn Ishi (2018) conducted a study aimed to detect the reality of applying e-learning in Algerian universities as a case study at the University of

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Biskra, and the results showed that the obstacles to using e-learning lies in using and sitting in front of the computer for a large period and increasing students' burdens in terms of costs and tests. The high cost of maintaining computers, and the lack of technicians. The study of Hayyani (2019) aimed to identify the possibility of using e-learning in addressing students' learning problems through the viewpoints of faculty members and students, the research reached the following results: A positive development in the views of both teachers and students towards the use of e-learning in addressing Learning problems after watching the lecture, and the possibility of using e-learning to address students' electronic problems. Bunyan (2019) evaluated the experience of Umm Al Qura University in the use of the e-learning management system (Blackboard) from the point of view of the faculty members and to detect the obstacles encountered in the use of the system (Blackboard). The study sample was composed of (40) faculty members. The researcher used the descriptive method and a questionnaire as a tool to collect the data needed to answer the study questions. The results of the overall mean of the use patterns were: (average sample direction with a mean of 3.02 and standard deviation of 1.43 and 60.0%, while the results of the overall mean average of the obstacles: the mean of the sample was medium with a mean of 0.38 and a standard deviation of 1.38 and 67.6%. The study recommended encouraging faculty members to use the (Blackboard) in the educational and research process in Saudi universities by embedding them into the calendar entries and training courses. Iskandar (2019) conducted a study aimed at identifying the reality of the quality of the e-educational service provided to remote master's students while identifying the deficiencies in the system using the Ishikawa method to diagnose the problem to suggest methods for improving it. The findings showed that the students' perceptions about the quality standards provided in e-education were one of the deficiencies in addition to some financial obstacles.

The study of Dabab (2019) aimed at revealing the barriers to the attitudes towards digital education in Algerian schools. The results indicated that the main barriers were the financial aspect, lack of possession of an e-learning device, as well as the community's lack of confidence in e-learning. Meajel (2018) examined the faculty perceptions of barriers to using the Blackboard system in teaching and learning at King Saud University in Saudi Arabia. The researchers applied an online questionnaire that was circulated to (117) faculty members to determine how they perceive barriers to using Blackboard. The results showed that academic rank, experience, gender, and training had statistically significant effects on faculty perceptions regarding barriers to using Blackboard in teaching and learning. However, there were no statistically significant differences in faculty perceptions regarding barriers to the utilization of Blackboard triggered by the use or non-use of Blackboard. The current study also showed that 'technological barriers' and 'institutional barriers' were the most highly identified barriers among the four categories of barriers explored in this study. The student barriers category came as a third important factor, while the faculty barriers category ranked at the lower rank.

In Almaiah et al. (2020) study, the researchers explore the critical challenges that face the current e-learning systems such as the blackboard system and investigate

the main factors that support the usage of e-learning systems during the COVID-19 pandemic. This study employed the interview method using thematic analysis through NVivo software. The interview was conducted with 30 students and 31 experts in e-learning systems at six universities in Jordan and Saudi Arabia. The findings showed that the factors that affect the usage of e-learning systems are (1) technological, (2) e-learning system quality factors, (3) trust factors, (4) self-efficacy factors, and (5) cultural aspects.

In 2020, a review conducted by Sharifov and Mustafa (2018) to provide an informed overview of e-learning platforms and review different features of Learning Management Systems (LMS), while exploring its implications, general issues, and challenges. The review adopted the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) checklist for standard reporting. The results showed that one of the main barriers to institutional adoption and usage of specific e-learning platforms is that administrators are not permitted to constantly modify the system to better fit the user's requirements. And that the limitations of online learning systems are motivation, costs, feedback and assessment, authentication, and compatibility.

Shehri (2018) study aimed to reveal the reality of students' and English language teachers' use of the electronic learning management system (Blackboard) in the College of Education at King Khalid University, and the study used the descriptive approach. The sample of the study consisted of (51) students from the General Diploma Program in Education and specialists in the English language during the academic year (1436/1437 AH). The study tool was a questionnaire consisting of (26) items. The study concluded the tasks provided by the Blackboard system, which are classified according to use into three categories (high, medium, and rare use). Among the most frequently used tasks: See announcements, alerts, content, and course grades. In addition to handing over assignments. As for the most important tasks that enjoyed moderate use, they were reviewing the description, outline, and course terminology, reviewing the course professor's information, participating in the course's forum, performing electronic tests, and sending and receiving messages. The most notable tasks that were rarely used were creating and sharing blogs and diaries and using the calendar and address book.

Based on the foregoing and through a general review of previous studies we can notice that all the studies agreed on these barriers:

1. Obstacles related to the blackboard e-learning system and its evaluation (Bunyan, 2019) which evaluated the experience of King Khalid University in using the blackboard e-learning management system, and Eryilmaz (2015) study, which aimed to identify the impact of using the Blackboard Mobile learn application on the development Attitudes of female students of Najran University towards mobile e-learning, and a study conducted by Ruwaili (2018) aimed at identifying the obstacles facing students of the College of Education at King Saud University in using the blackboard e-learning management system. Dhali (2018) identifies the obstacles to using e-learning from the point of view of faculty members at

Najran University, and a study conducted by Bunyan (2019) evaluated the experience of Umm Al-Qura University in using the electronic learning management system "Blackboard" from the point of view of faculty members and the study of (Shehri, 2018; Almaiah et al., 2020).

2. Obstacles related to the qualifications of teachers and students to use the e-learning Blackboard (Al-Qahtani, 2014; Ibn Ishi and Ibn Ishi, 2018; Eryilmaz, 2015; Hayyani, 2019; Scholtz, 2015; Soman, 2011) aimed at knowing the reality of using Students are teachers of English for the E-Learning Management System (Blackboard) in the College of Education, King Khalid University.
3. The lack of adequate computer equipment and physical constraints (Alkmaishi, 2017; Ashi, 2017; Ghayad, 2016; Omar, & Al-Masabi, 2017; Shehri, 2018).
4. Some of them presented students' perceptions about e-learning and social obstacles (Almaiah et al., 2020; Blieck & Brussel, 2011; Shehri, 2018, 2010).

The current study has benefited from previous studies in crystallizing the problem of the study, defining its objectives, stating its importance, determining the appropriate statistical treatment, and linking its results with the results of previous studies. The current study also benefited from the rooting of theoretical literature and previous studies. And, this study is distinguished from previous studies, as none of the previous studies has studied the obstacles to implementing the Blackboard e-learning system in the Community College of Imam Abdul Rahman bin Faisal University, and this is the aspect that this study will cover.

3 Methods and Procedures

3.1 Study Methods and Procedure

The researcher adopted a descriptive and analytical approach by studying the research r problem and explaining it scientifically, to reach a reasonable interpretation, which allows the researcher to identify the framework for the research problem and assess the results of the research.

3.1.1 Study Population and Sample

The study population consisted of all students at the College of Applied Sciences and the College of Sciences and Humanities at IAU 2021/2022, and a simple random sample was chosen from the study population from College of Applied Sciences and College of Sciences and Human (Kindergarten undergraduate students), and the study sample consisted of (400) female students at the College of Applied Sciences and the College of Sciences and Humanities in the Dammam branch.

3.1.2 Study Tool

After reviewing the theoretical literature and previous studies related to the issue of obstacles to the use of e-learning in universities, schools, and educational institutions, the questionnaire was built to identify the barriers that hinder the implementation of the e-learning management system (Blackboard system) among female students at the Applied Colleges and the College of Sciences and Humanities at IAU, and the questionnaire consisted of (33) items distributed into four areas: the first area: administrative barriers (11) items, technical barriers and (9) items, financial barriers (7) items and social barriers (6) items. To examine the inferences of the construct validity of the measure, the correlation coefficients of the scale items with the area to which they belong were extracted, where the items of the measure were analyzed and the correlation coefficient of each item was calculated, as the correlation coefficient here represents the inferences of validity for each paragraph in the form of a correlation coefficient between each paragraph and the area that belongs to it as shown in Table 1.

It should be noted that all correlation coefficients were of acceptable scores and statistically significant, and therefore none of these items was omitted.

To check the content validity the tool was presented in its initial form to specialized and experienced arbitrators in education and science techniques in Jordanian and Saudi universities to verify the appropriateness of the items, and to recommend any omission, addition, or modification to the items of the questionnaire. Also, the internal consistency was verified. To verify the reliability of the tool, the internal consistency was calculated according to the Cronbach Alpha as shown in Table 2. These ratios were considered appropriate for this study.

Table 1 Correlation coefficients between paragraphs and the area to which they belong

No.	Correlation coefficients with the area	No.	Correlation coefficients with the area	No.	Correlation coefficients with the area	No.	Correlation coefficients with the area
1	0.740**	11	0.584**	21	0.713**	31	0.754**
2	0.493**	12	0.655**	22	0.758**	32	0.590**
3	0.724**	13	0.612**	23	0.548**	33	0.679**
4	0.645**	14	0.698**	24	0.706**		
5	0.698**	15	0.658**	25	0.761**		
6	0.767**	16	0.572**	26	0.489**		
7	0.609**	17	0.591**	27	0.631**		
8	0.730**	18	0.465**	28	0.730**		
9	0.563**	19	0.667**	29	0.752**		
10	0.705**	20	0.691**	30	0.755**		

*Statistical function at the significance level (0.05)
**Statistical significance at the level of significance (0.01)

Table 2 Cronbach Alpha internal consistency

Areas	Internal consistency	Items
Administrative barriers	0.760	11
Technical barriers	0.766	9
Financial barriers	0.847	7
Social barriers	0.863	6
Total	0.816	3

3.2 Study Procedures

The researcher followed these producers when conducting the study

- Reviewing the literature and previous studies concerning the e-learning portal website.
- Preparing the study tool, as previously explained.
- Presenting the questionnaire to specialized arbitrators and making any required modifications.
- Choosing the study sample female students at the Community College, using a simple random method from the colleges of the university.
- Applying the questionnaire to students at the selected community college for the second semester of the academic year 2019/2020.
- Using statistical analysis to analyze the responses.
- Extracting and interpreting the results and linking them to previous studies to answer the study question.

3.3 Statistical Treatment

The data obtained from the field study were analyzed statistically, using the Statistical Package for Social Sciences (SPSS—Statistical Package for Social Sciences) and to answer the study questions, the following statistical methods were used: The use of descriptive statistic measures, including the frequency and percentages.

4 Results

The researcher used the 3-point Likert scale to correct the study tool by giving each of its items one score out of three (high degree, moderate degree, low degree), which is represented numerically (3, 2, 1) respectively, and the following scale was adopted to analyze the results, and the interpretation of the results based on the percentages, and the mean according to the following estimates (Table 3).

Table 3 The 3-point Likert scale used to correct the study tool

Degree	Mean
Low	1.00–1.66
Moderate	1.67–2.33
High	2.34–3.00

4.1 Results of the First Question

What are the administrative obstacles that face female students the College of Applied Sciences and the College of Sciences and Humanities at IAU during the implementation of the Blackboard System? To answer this question, means, frequencies, and standard deviations of the estimates of the respondents were calculated on the items of the area of administrative barriers as indicated in Table 4.

Table 4 shows that the arithmetic means of the items ranged from (1.18–2.88), where Item (6) which states, "I think the college network connection is weak / the internet." ranked first with a mean of (2.88), while Item (9) which says, "I think that

Table 4 Mean and standard deviations of administrative barriers

Rank	No.	Items	Mean	SD	Degree
6	1	I think the college network connection is weak " the internet."	2.88	0.195	High
10	2	I think the Blackboard system is not always available in college	2.80	260	High
5	3	I think they lack readiness in the infrastructure for e-learning	2.70	0.192	High
1	4	I think there is a weakness in the capabilities of the technical support team to help female students on the Blackboard	2.66	0.290	High
8	5	I think the college does not have internet access for the student	2.40	0.240	High
11	6	I think there is no clear guideline for dealing with the Blackboard system	1.60	0.295	Moderate
4	7	I think there is insufficient support from the administration (department and college)	1.75	0.190	Moderate
2	8	I think the college does not offer intensive training courses on the degree of using the blackboard system	1.70	0.070	Moderate
3	9	I think there is a lack of computer labs to use the blackboard system	1.50	. 070	Low
7	10	I think there is centralization in the administrative system	1.22	0.088	Low
9	11	I think that there are no incentives for female students to the point of mastering the system	1.18	0.060	Low
		Total Administrative barriers	2.13	0.190	Moderate

Table 5 Mean and standard deviations of the degree of e-learning obstacles that College students face are arranged in descending

Rank	No.	Areas	Mean	SD	Degree
3	1	Technical barriers	1.37	0.210	Low
2	2	Financial barriers	2.20	0.320	Moderate
1	3	Social barriers	2.60	0.358	High
		Total	2.05	0.243	Moderate

there are no incentives for female students to the point of mastering the system." ranked last with a mean of (1.18). The overall means for the area " administrative obstacles" is (2.13.) and it came to a moderate degree. The results indicate that there are prominent administrative barriers in university education, and this is consistent with (Naveed et al., 2017), which showed that administrative barriers were facing the use of the blackboard e-learning management system. And affect the educational system (Scholtz, 2015), which showed the effect of administrative obstacles on students in acquiring the skills of blackboard (Dasimani, 2017) concluded that there were administrative obstacles facing students such as students' lack of computers and Internet, poor training of technicians, weakness and interruption The Internet disagreed with (Soman, 2011), which aimed to identify the importance of e-learning in achieving human development (Shehri, 2018).

4.2 Results of the Second Question

What are the technical, financial, and social barriers that female students at the Applied College and the College of Sciences and Humanities IAU face during using the Blackboard System? To answer this question, mean and standard deviations were extracted as shown in Table 5.

Table 5 shows that the means ranged between (2.30–1.38), where the area of social barriers came in first place with the highest mean of (2.60). Financial barriers ranked second with a mean of (2.20) followed by technical barriers which ranked last with a mean of (1.37). Where the overall mean records (2.05). This result is consistent with (Naveed et al., 2017), which showed that the technical obstacles have a major role in the student's failure to acquire blackboard skills and affect his performance in tests, assignments, etc., and with the study of (Hayyani, 2019) which indicated a positive development in the views of both teachers and students towards the use of e-learning in dealing with learning problems after watching the lecture, and the possibility of using e-learning in addressing students' electronic problems which solve students' problems in financial and social obstacles, and differed with (Blieck & Brussel, 2011) which pointed out that the obstacles facing faculty members in using the "blackboard" system, as well as financial, technical, and social obstacles. Also, the results of the study of (Almaiah et al., 2020; Sharifov & Mustafa, 2018; Shehri, 2018) support the

result of the current study. The means and standard deviations of the estimates of the study sample individuals were calculated on the paragraphs of each field separately, as they were as follows.

4.2.1 Technical Barriers

Table 6 shows that the means ranged between (1.60 and 1.20). Item (9) which states "I find it difficult to deal with e-learning systems such as Blackboard and Zoom." came first place with a mean of (1.60), while Item (1) "I think the fast internet connection is weak." ranked last with a mean of (1.20). The overall mean for the technical obstacles is (1.37) as the technical obstacles play a major role in the student's receiving of some skills related to e-learning, especially the blackboard system. The overall mean came to a low degree because technical means need highly skilled technicians and high university support to enhance technical qualifications. This result is consistent with the study of (Sharifov & Mustafa, 2018; Shehri, 2018) which indicated the need for technical skills within the programs for preparing a faculty member and because technical skills are necessary for students in terms of preparation and qualification.

It is also consistent with the study Blackboard educational institution study (2010) which revealed that technical obstacles cause deterioration in the case of the academic student and the study of Eryilmaz (2015) which showed that one of the most important effects of technical obstacles is the difficulty of transferring and uploading large-sized files to smart devices, the difficulty of uploading files to the electronic courses website using smart devices, and the difficulty of transferring and exchanging files between learners using smart devices. The results are also consistent with (Sharifov & Mustafa, 2018; Bunyan, 2019; Shehri, 2018, 2010) which showed that the technical

Table 6 Means and standard deviations of the technical barriers, arranged in descending order according to the means

Rank	No.	Items	Mean	SD	Degree
1	12	I think the fast internet connection is weak	1.20	0.050	Low
2	13	I believe e-learning systems lack periodic maintenance	1.22	0.078	Low
3	14	I think the e-learning system faces many penetrations	1.30	0.070	Low
4	15	I frequently encounter interruptions on the internet	1.33	0.187	Low
9	16	I find it difficult to deal with e-learning systems such as Blackboard and Zoom	1.60	0.295	Moderate
5	17	I think e-learning infrastructure lack readiness	1.35	0.192	Low
6	18	I think curriculum development commensurate with e-learning is weak	1.40	0.194	Low
7	19	I think e-learning applications are not available in Arabic	1.45	low	Low
8	20	I think that the student is not prepared for e-learning	1.50	low	Low
		Total technical barriers	1.37	0.190	Low

obstacles have the most important impact on the e-learning process, especially the blackboard system.

4.2.2 Financial Barriers

Table 7 indicates that the means ranged between (1.94 and 2.20). Item (21) stating, "I think using e-learning systems outside the university is more costly." has the highest mean (2.20), and Item (27) "I think the incentives given to students for using e-learning systems are not sufficient" came last with a mean of (1.94). Table 7 illustrated that the overall mean of the items of the financial barriers is (2.20.) and it records a moderate degree. The researcher attributed this result to the fact that the financial obstacles have a significant impact on financial support for computer technologies and equipment and their provision, and rehabilitation through intensive courses given by skilled and specialized technicians. This cannot be achieved without the financial aspect as the lack of financial support leads to many problems for students in the classroom and outside, and these results are consistent with the study of (Ibn Ishi and Ibn Ishi, 2018).

One of the most important results indicated that there are financial barriers that lead to an increase in students' financial burdens in terms of costs of online learning, tests, the high cost of maintaining computers, and a lack of technicians. Ibn Ishi and Ibn Ishi (2018) and Shehri (2018) confirmed that the financial constraints hinder the application of comprehensive quality standards in e-learning, including students' possession of the required skills for using the blackboard system, and their possession of a computer to keep up with the e-learning education and its continuation. The results of this field are consistent with (Dasimani, 2017) which confirmed that the financial obstacles include technical support, and the weakness of technical updates to the e-learning system, which is reflected in the student's performance. This result

Table 7 Mean and the standard deviations of the financial barriers arranged in descending order

Rank	No.	Item	Mean	SD	Degree
1	21	I think using e-learning systems outside the university is more costly	2.20	0.350	Moderate
2	22	I think the student is overloaded with teaching	2.18	0.408	Moderate
3	23	I think there is a need for a human cadre of professionals and technicians in e-learning	2.17	0.453	Moderate
3	24	I think smart devices which support e-learning application are expensive	2.15	0.453	Moderate
5	25	Lack of laboratories and equipment to assist in e-learning	2.12	0.458	Moderate
6	26	I think not every university student	2.05	0.426	Moderate
7	27	I think the incentives given to students for using e-learning systems are not sufficient	1.94	0.463	Moderate
		Financial barriers	2.20	0.346	Moderate

is also consistent with the result of Alkmaishi (2017) and Ghayad (2016) which emphasized the role of financial obstacles in 'creating a wide gap in e-learning resulted from the weakness of the technicians, the lack of computer labs, and the financial support offered to the university students.

4.2.3 Social Barriers

Table 8 shows that the means of this area ranged between (2.40–2.90). Item (28) which came at the first rank with a mean of (2.90) states "I think that the educated members of the community are frustrated because of their lack of mastery of e-learning" with an average of (2.90), Where Item (33), which states "I think that body language and gestures are not present in e-learning and hinder the communication process" came at the last rank with a mean of (2.40). The overall mean of the social obstacles record (2.60) and a high degree. These results may be attributed to the fact that, this kind of learning is not highly accepted by communities, and that the society's culture only believes in education based on face-face interaction and physical presence in the classroom "traditional" and this is consistent with Dasimani (2017), which confirmed that social obstacles lead to underestimating this kind of learning and to the result which indicated the difficulty of dealing with the electronic system. It also agrees with Naveed et al. (2017), which confirmed that social obstacles have a great impact on the student's compatibility with e-learning. Badawi (2015) pointed out that students 'lack of motivation and direct support from the community affected their awareness to using e-learning in all its standards and types, and the study of Sharifov and Mustafa (2018) and Omar and Al-Masabi (2017), which emphasized the impact of social obstacles in the e-learning process.

Table 8 Means and standard deviations of the social barriers

Rank	No.	Items	Mean	SD	Degree
1	28	I think that the educated members of the community are frustrated because of their lack of mastery of e-learning	2.90	0.508	High
2	29	I think that society does not accept e-learning	2.85	0.515	High
3	30	I think the community awareness programs for e-learning are not sufficient	2.70	0.550	High
4	31	I think there is a difference between e-learning and the culture of society	2.60	0.530	High
5	32	I think there is a difficulty with the idea of e-learning by the community	2.50	0.533	High
6	33	I think that body language and gestures are not present in e-learning and hinder the communication process	2.40	0.535	High
		Total	2.60	0.530	High

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5 Conclusion

The study concluded by answering the study's first question that, university students face administrative barriers, which came to a moderate degree and a mean of (2.13). The result also showed that the obstacles students face when using the blackboard system are represented in the following: technical barriers which came with a mean of (1.37) and a low degree, financial barriers which records a mean of (2.20) and a moderate degree. Where the area of the social barrier has the highest mean (2.60) and obtained a high degree. The study recommended promoting the technical side in universities by enhancing the use of e-learning, providing financial support for e-learning use through training of specialists and technicians, and holding educational sessions for students and community members to enhance the image of e-learning.

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Possession of Faculty Members and Students of Communication Skills and Their Reflection on Achievement in Saudi Universities

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Abstract This study aimed to unveil the possession of faculty members and students of communication skills and their reflection on achievement in Saudi universities. The study population comprised (420) staff members representing all departments of the preparatory year. The sample comprised (136) male and female staff members which represent (43%) of the study population. To achieve the objectives of the study, a questionnaire was designed in compliance with the Likert five-point scale comprising of five-axis skills: speaking, listening, dialogue, persuasion and affecting, and negotiation. The most important findings were: Students' overall degree of practice verbal communication skills from the perspective of staff members was high. There were no differences with statistical significance at the statistical level ($a \geq 0.05$) for staff member responses attributed to social type variable, but there were differences with statistical significance in staff members' responses regarding students'

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_22

academic departments in favour of self-development with a mean of (3.94) at the function level (a $\geq$ 0.05).

Keywords Oral communication skills · Teaching staff members · Saudi universities

1 Introduction

Both training and constant learning got an increasing interest during the second half of the twentieth century due to the unprecedented qualitative and quantitative revolution it witnessed. The success of any society has been measured by the extent of its adaptation to such developments. It has been proved that constant learning and training constitute one of the methods of achieving social development. Training programs via verbal and non-verbal communication skills are essential for educational plan development and for university students who need to practice such skills. Therefore, the researchers sought to make the ideal of sustainable professional development come true through developing self-esteem to upgrade university student levels by acquiring the necessary skills. As reported by Keyton (2017) humans conduct a great number of daily calls in which they exchange news, opinions, feelings, points of view, queries, and dialogues. Through such calls some give orders and others receive them. This kind of activity done by individuals is called communication skills (Aljumah et al., 2021; Alzoubi et al., 2020; Nazir et al., 2021). Thus, communication is an integrated process that depends on participation between two parties a sender and a receiver (Alshurideh & Shaltoni, 2014; Alyammahi et al., 2020; Kurdi et al., 2020). Where they exchange roles conveying their feelings, opinions, and trends (Al-Sugheir, 2003). It also found that communication to play its role, parties need to have active skills such as listening, speaking, persuasion, negotiation, and affecting (Artman, 2005). However, it was pointed in Al-Husami (2020) that relations among university students on campus play an important role in their academic performance and their social and cultural awareness. Most of these relations are academic in which the students exchange ideas and a variety of experiences (Alshamsi et al., 2020; Amarneh et al., 2021; Leo et al., 2021). On the other hand, the student's success in his relationships and contacts with others will have a positive effect on his psyche which accordingly affects his academic performance (Alhamad et al., 2021; Al-Hamad et al., 2021; Alsharari & Alshurideh, 2020). Despite the significance of communication process presented through verbal and non-verbal skills for exchanging information, ideas, trends, experiences, feelings, and opinions, we find many university students lack active communication skills, an issue that hampers achieving objectives of the communication skills resulting in many problems (Akour et al., 2021; Alshurideh et al., 2021; Sultan et al., 2021). Meetings and debates mostly end up with altercations and maybe into brawls. This is one of the factors that prompted writing this paper.

1.1 Significance of the Study

University staff members complain about disputes that happen among students themselves and between students and instructors due to a lack of communication skills. Thus, a need to secure a tool to monitor students' various communication skills became necessary to identify the degree of their practice of communication skills. Such a thing might end up with recommendations that urge holding training programs to develop students' skills by which they will be able to communicate and to have better awareness, socially and culturally (Al-Hamad et al., 2021; Al-Maroof et al., 2021). The significance of the study lies in providing libraries with the information needed for students, staff members, researchers, in addition to identifying communication skills and their positive influence on students at different stages of learning (Al Kurdi et al., 2020).

1.2 Problem and Questions of the Study

The problem of the study rises to from the apparent defect Possession of faculty members and students of communication skills and their reflection on achievement in Saudi universities. Besides, this defect has its negative impacts on students, on-campus or outside. The problem of the study is embedded in identifying the degree of practising oral skills from the perspective of staff members.

1.3 Questions of the Study

The questions might be outlined in the following:

1. What is the Possession of faculty members and students of communication skills and their reflection on achievement in Saudi universities?
2. From the Possession of faculty members and students of communication skills and their reflection on achievement in Saudi universities ($a \geq 0.05$) which might be attributed to social category?

1.4 Objectives of the Study

The study attempts to find the answer to the following five questions it poses:

1. What is the degree of faculty members' and students' possession of communication skills and their reflection on achievement in Saudi universities?
2. Are there differences with statistical significance for the degree of practising verbal communication skills by preparatory year students Possession of faculty

members and students of communication skills and their reflection on achievement in Saudi universities (a ≥ 0.05) from the perspective of staff members which might be attributed to social category Variable?
3. Are there differences with statistical significance between the degree of students' practice at Imam's university at the statistical level (a ≥ 0.05), from the perspective of staff members, attributed to academic department variable?
4. Are there differences with statistical significance at the statistical level (a ≥ 0.05) between the practice of preparatory students, from the perspective of staff members, attributed to years of experience?
5. Are there differences with statistical significance between students' degree of practice regarding verbal communication skills at the statistical level (a ≥ 0.05), from the perspective of staff members regarding the interaction between social category, years of experience, and academic department?"

1.5 Limitations of the Study

Limitations of the study are:

1. Topic Limitation: What is the Possession of faculty members and students of communication skills and their reflection on achievement in Saudi universities
2. From the Possession of faculty members and students of communication skills and their reflection on achievement in Saudi universities (a ≥ 0.05) which might be attributed to social category?
3. Space limitation: students in Saudi universities—old building campus.
4. Huma limitation: The study included all teaching staff members (males and females) of all academic ranks.

1.6 Terminology of the Study

These are as follows:

Communication skill: The individual can send and successfully receive massages providing propitious feedback measured by the degree the individual gains via the tool.

Oral communication skill: It is the communication performed through words by which a voice message is given to a receiver and has several connotations. The language used, voice pitch, and place of articulation of words all play a significant role by adding additional meanings to the message.

Teaching staff members: they are the instructors who teach the preparatory year students at the University of Imam Abdul Rahman Bin Faisal.

Preparatory year at the university: the year composes three tracks: health track which includes faculties of medicine, dentistry, applied medical sciences, nursing and clinical pharmacy; engineering track includes faculties of architecture and planning, design engineering; scientific track includes faculties of computer sciences and information technology and business administration track which includes any other faculty which might be added up to the preparatory year following registration rules prescribed by university counsel.

The preparatory academic year comprises two semesters extendable to one more semester (Dammam university, preparatory year, 2016).

Male and female students of the preparatory year: they are male and female students who are admitted to the preparatory year after meeting registration conditions set by the deanship at the University of Imam Abdul Rahman Bin Faisal.

2 Theoretical Literature and Previous Studies

2.1 Theoretical Literature

This part of the study will focus on communication concepts, significance, elements, and types.

Communication can be defined as reported by Abu Isbaa and Saleh, (1996), a process or mechanism in which a certain person in a certain situation sends a message, with information, opinions, or feelings, to others to achieve a certain goal using a language or expressions irrespective of how the message was transmitted (Abu Arqoob & Salah, 1993; Al-Mahawi, 2004; Al-Tanoobi, 2001). While (Al-Olayyan & Al-Tobaji, 2005) believes that the communication process is just sending messages, receiving them, and getting feedback. From what preceded, one can see that communication is a process of exchanging, ideas, information, and feelings between parties to achieve a certain goal. This skill (communication) can be either verbal or non-verbal. Communication is very important for students to realize how significant it is. If listeners fail to understand your words or shun listening to you for feeling bored with your speech, then you lose the goal you aspire to achieve from communicating with your friends or acquaintances. Communication also plays an important role in the life of a university student as it helps him to positively learn from friends and teaching staff members, thus creating an environment of friendship and appreciation. Communication is the tool by which the human achieves his objectives. Its significance is manifested in the processes of speaking, listening, persuasion, negotiation, and leadership. In universities, communication facilitates and reinforces contacts between academic departments (Ismael, 2016; Sedeeq, 2015; Teska, 2003).

The communication process includes these elements: sender, message, means, and receiver. Two more elements were added byAl-Olayyan and Al-Tobaji (2005) namely, feedback and jamming.

The following illustrates such elements:

1. Sender: He is the source of information, initiator of the message who tries to successfully convey his message to the receiver. He might be a teacher who wants to convey his message to students, a student, or a physician. The good sender is the one who can transmit information depending on his good language.
2. Message: It is to the heart of the communication process and the basic axis on which the process rests. It takes numerous forms; it might be written words, oral, body language such as smiling, or griming; it might be clear or ambiguous (Abu Arqoob & Salah, 1993).
3. Receiver: He is the other party who receives and responds to the message if it fits, then he sends feedback. The message might include information or data.
4. Communication goes through different means or channels such as the message that is sent to the receiver. It might be personal talks, telephone calls, memoranda (Al-Mahawi, 2004).
5. Feedback: It is the reaction toward the message which reflects message acceptability or rejection (Abuhashesh et al., 2021; Al-Olayyan & Al-Tobaji, 2005).

Communication can be practised through these two main methods:

1. verbal communication which (Al-Oufi, 2012) is defined as how words, phrases, and sounds are sent by the sender orally through mouth and tongue and the receiver gets these sounds via his ears. Good speech enjoys the following: good quality, sound type, word choice, and adaptability.
2. Non-verbal communication: It is a method of conveying our feelings, opinions, and viewpoints through body movements (Abu Arqoob & Salah, 1993; Al-Khouri, 2000; Bodie, 2011; Stowe et al., 2012). It is a language that has its features, meanings, and implications. It includes movements of the (eye, face, hands, and distance).

Communication has various types including the following:

1. Speaking skill: it is an oral type of communication by which the speaker gets in direct contact with others. Weakness in this skill makes the speaker lose time and opportunities due to indifference and inaccurate talk (Alhamad et al., 2021; Hijab, 2003).
2. Listening skill: It is not only limited to what the ear hears in receiving voice vibrations, but it is an attempt to comprehend what the speaker says to be either sympathetic or adversary toward him and that requires putting ourselves in his shoes; thus, be imaginative.
3. Persuasion and affecting skill: It is the ability to influence others. It is a human action that is effective in proportion with its perfection.
4. Dialogue skill: it is a type of talk between two persons or two groups who debate in an equal manner.
5. Negotiation skill: It is a joint process to adapt conflicting interests to come up with a solution acceptable to both parties.

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2.2 Previous Studies

This section reviews the relevant literature.

Al-Khasawneh (1998) conducted a study aiming to unveil hindrances in the process of communication. In that study, she attempted to identify communication problems between students of higher studies and teaching staff members at Yarmouk university from the perspective of the students. She tried to specify problems that lead to making the communication process defective. The study concluded that most of the problems in the process resulted from not providing students with chances to talk face to face to staff members, besides preferences given by staff members to certain students at the expense of others, in addition to hubbub outside classrooms. The study also concluded that young teaching staff members have more contact with students.

Al-Nathami (2002) conducted a study entitled "communication skills of teaching staff members in the faculty of education at Yarmouk university from the perspective of students" which aimed to determine whether teaching staff members have communication skills from the perspective of students. The study came up with the following results: staff members of the faculty of education possess that skill. It was also found that there were differences with statistical significance regarding communication skills among staff members in the faculty which might be attributed to the variable of the academic department, but there were no differences about the academic experience.

Rollins (2004) conducted a study entitled "Needed communication skills during initial employment as perceived by graduates of the West Virginia University Davis College of agriculture, forestry, and consumer sciences". The study aimed to determine the communication skills used during initial employment of graduates of Davis college who were registering in the communication course of agricultural resources. The study came up with the following conclusions, the foremost of which are: The graduates use communication skills, especially those of speaking and listening, but lack the skill of negotiation and persuasion. The study also revealed that there were differences with statistical significance between the means of cognition and students' use of communication skills from the perspective of managers which might be attributed to gender, but there were no differences with statistical significance between means of achievement by college students for verbal communication from the perspective of managers attributed to the variables of work type and job performance. Zhang (2011) conducted a study entitled "Developing communication skills of Chinese students in Canada" to verify the performance of oral communication of Chinese students in Canada. To achieve the objectives of the study, the researcher adopted the experimental descriptive method. The results revealed that there were statistical differences between the means of the degree of practice among Chinese students from the perspective of their instructors that might be attributed to qualification, academic department, and gender. But there were no differences with statistical significance between means of the degree of the practice of Chinese students that might be attributed to instructors' age and students having high communication skills that comply with skills of speech and negotiation. Ibn Jahlan (2009) conducted a study

entitled "The effectiveness of a training program for mathematics teachers based on the mathematical communication standard-on achievement and development of oral and written communication skills among students at Saudi Intermediate Schools." The researcher designed a training program. The study concluded differences with statistical significance at the statistical level (a = 0.05) between means of sample members of achievement in favour of the experimental group. The researcher recommended that universities and faculties of education and those specialized in math prepare math teachers through verbal, and written communication skills. In 2015, Sharon (2015) conducted a study entitled "strategies for developing international communication skills for business students". The study aimed to reinforce students' communication skills through teaching staff and employees at Walden University and to ascertain the vision of teaching staff members and employees' communication skills of business graduates. The results indicated that students developed their communication skills after graduation. There were no differences with statistical significance between the means of the business of students' achievements from the perspective of instructors attributed to specialization and academic degree.

3 Methods and Procedures

This section discusses methods and procedures used in the study as presented in methodology, population, and sample.

3.1 Study Approach

The researcher used the descriptive analytical survey method that collects information from the population that comprises teaching staff members at the deanship of preparatory year of Imam Abdul Rahman Bin Faisal University. The information will be analyzed afterwards.

3.2 Study Variables

3.2.1 Independent Variables

1. Social type: It has two levels (male and Female)
2. Department: It has five levels (self-development, English language, computer, basic sciences, and Islamic culture).
3. Experience: It has four levels (From 1–5, 5–10, 10–15, 16 and above).

Table 1 Population distribution by social type, department, and years of experience

Variable	Levels	Number		
Social types	Social type	Male	Female	Total
Academic department	Self-development	38	31	69
	English language	52	66	118
	Islamic culture	12	12	24
	Computer	18	28	46
	Basic sciences	29	34	63
	Total	149	171	320
Experience	1–5	31	77	108
	6–10	65	70	135
	11–15	27	20	47
	16<	17	13	30
	Total	149	171	320
	Total	320		320

3.2.2 Dependent Variable

The communication skills possessed by the faculty members and students and their reflection on achievement in Saudi universities during the academic year 2022/2021 as perceived by teaching staff members. This was quantitively measured by the study tool.

3.3 Population and Sample

The population of the study comprised all teaching staff members of the preparatory year of Imam's university during the academic year 2022/2021. The number of staff members amounted (230). The sample of the study was collected using the purposive method. Tables 1 and 2 represent the population and sample of the study divided according to social type, academic department, and years of experience.

3.4 Sample of the Study

The sample was randomly selected from teaching staff members of the preparatory year at Imam's university the numbers. Table 2 shows the distribution of the sample (n = 136) by variables.

Table 2 Sample distribution by study variables

Variables	Levels	Number		Percentage	
Social type	Social type	Males	Females	Males	Females
		69	67	22	21
Total		**136**		**43**	
Self-development	Self-development	20	24	06	07
English language	English language	18	25	06	08
Islamic culture	Islamic culture	9	5	3	02
Computer	Computer	10	5	3	02
Total		69	67	22	2
		136		**43**	
	Basic sciences	12	8	4	2
	Total	69	67	22	21
	1–5 years	13	10	4	3
	6–10	14	17	5	5
	11- 15	29	30	9	9
	16<	13	10	4	4
	Total	69	67	22	21
Total		135		34	

3.5 Tool of Study

A questionnaire was prepared by the researchers to investigate the degree of practising verbal communication skills by preparatory year students from the perspective of teaching staff members at Imam's university during the academic year 2019/2020. Theoretical literature and relevant studies were reviewed. The questionnaire contains (5) fields regarding verbal communication skills (speaking, listening, dialogue, persuasion and affecting, and negation). All fields are covered by (39) items divided as shown in Table 3.

Table 3 Distribution of questionnaire items into five skills

Field	Items number
Speaking skill	7
Listening skill	10
Dialogue skill	5
Persuasion and affecting skill	9
Negotiation skill	8
Total	39

In compliance with the Likert five-point scale, each item included the following ranks: (very high, high, medium, little, and very little). They were given the following points: (5,4, 3,2,1) respectively.

3.6 Validity and Reliability of the Tool

The tool in its first version was sent to a group of arbitrators (n = 10) to examine clarity and drafting of the items, in addition to items deletion, amending and belonging to its file. Some items were amended and others deleted, but all judges agreed on the suitability of 80% of the items. Alpha Cronbach coefficient was used to calculate the scale coefficient. The reliability percentage was (0.94) which is considered acceptable for the study objectives. The study was applied to a pilot sample (n = 50) of teaching staff members who were randomly selected from the study population. (160) copies of the questionnaire were electronically administered to teaching staff members. (150) copies were retrieved, (14) were excluded due to incompletion. Data were tabulated in tables using SPSS to process the necessary statistics of the study.

3.7 Statistical Processing

Arithmetic means standard deviations, coefficients, and one-way ANOVA were used. (T-test) was also used to explain the differences in the degree level of students" use of communication skills following the variables: social type, academic department, and years of experience.

4 Study Results and Explication

Through limitations, study sample, and statistical processing used in the study, the researchers came up with the results presented in the following tables. Results were interpreted in ratio to percentages and arithmetic mean, according to the estimates in the following Table 4.

4.1 Results and Interpretations of the First Questions

Which is: "What is the degree faculty members' and students' possession of communication skills and their reflection on achievement in Saudi universities?", The results are presented in the following tables.

Table 4 Arithmetic mean

Mean	Level of response (practice)
1–1.80	Very low
1.80–2.60	Low
2.61–3.40	Medium
3.61–4.20	High
4.21–5	Very high

Table 5 reveals that the arithmetic means for all axes of the questionnaire ranged between (3.47–3.94) out of (5). The total grade for all axes was a mean of (3.66) high axes of speaking, dialogue, and negotiation also ranked high; persuasion and affecting ranked medium. This is due to students' practice of speaking, dialogue, and negotiation with each other and with staff members. This result agrees with those of Al-Oufi (2012) and Bodie (2012). As for persuasion skills, students didn't practice it much for they need skills of high rank while listening is a normal skill.

Table 6 reveals that the arithmetic means of all items ranged between (3.30–4.22) out of (5). All means are between very high and high except for item (quickly stops discussions that don't interest him) ranked medium; items: (busy himself with drawing…; evaluate some topics…; jots down notes….;) all ranked little. The table also shows the highest practised item was:

- Returns greeting ….
- Deals with others respectfully ….
- Defends his right in negotiation ….
- Respects feelings of the other party ….
- Achieves his goals through noble means….

The means of answering such items ranged between (30.2 and 4.22) out of (5) and that might be because students' level of communication skills for both males and females was high and associated with academic status. The students possess such skills and practice them on campus. The arithmetic means of the items: (returns greeting …; deals with others respectfully and defends his right while negotiating …) ranged between (4.6; 4.11, 4.22) indicating a very high or high degree of practice which might be attributed to the importance of shaking hands, a social behavioural

Table 5 Descriptive analysis of communication skills

	Axis	Arithmetic mean	Standard deviation	Degree
5	Negotiation	3.94	057,081	High
1	Speaking skill	3.68	70,584	High
3	Dialogue skill	3.66	064,934	High
4	Persuasion and affecting	3.56	082,785	Medium
2	Listening skill	3.47	079,305	Medium
	Total	3.66	063,253	High

Table 6 Arithmetic means and standard deviation for the degree of practising verbal communication skills by preparatory year students (N = 13)

	Item	Arithmetic means	Standard deviation	Degree practice	Rank
1	Returns greeting and shake hands with the other party	4.22	0.835	Very high	34
2	Deals with others respectfully while negotiating	4.11	1.023	High	37
3	Defends his right while negotiating politely and capably	4.06	0.727	High	38
4	Respects feelings of the other party while negotiating	4.04	0.682	High	35
5	Achieves his goals through using noble means and values	4.03	0.815	High	39
6	Easily accepts others' apologies when they err	4.01	0.71	High	19
7	Listens carefully and doesn't interrupt the other party	3.92	0.761	High	9
8	Negotiates others in a skillful manner	3.88	0.699	High	18
9	This shows that he enjoys listening to the other party	3.79	0.758	High	13
10	Repeats certain words and sentences which reflect interaction with the other party	3.78	1.267	High	11
11	Can understand other needs while talking to them	3.78	1.127	High	3
12	Allows others to present their opinions through dialogue	3.78	1.011	High	26
12	Enjoys persuading others on a certain issue	3.75	0.917	High	28

(continued)

Table 6 (continued)

	Item	Arithmetic means	Standard deviation	Degree practice	Rank
14	Enjoys discussing social issues with his instructors	3.74	1.059	High	25
15	The speaker notices listener's attention through answering yes or through humming	3.71	1.087	High	14
16	He cares about how his speech affects other	3.71	0.997	High	1
17	Tries to use simple words	3.68	0.851	High	4
18	Conforms with speaker's psychological case in pleasure or sorrow	3.66	1.08	High	17
19	Can easily understand the views of others	3.64	1.055	High	21
20	Cares about conformity between sound Pitch and the topic	3.63	1.047	High	6
21	Apologizes in case he makes a mistake	3.61	0.943	High	22
22	Friendly starts speaking to a foreigner	3.6	0.929	High	7
23	Asks the speaker to speak clearly to understand words	3.56	1.047	High	8
24	Provides orally the other party with convincing facts	3.55	1.002	High	27
25	Solves his problems with others without losing control over his emotions	3.55	1.002	High	29
26	Faces critiques of others with Pleasures	3.55	0.893	High	30

(continued)

Table 6 (continued)

	Item	Arithmetic means	Standard deviation	Degree practice	Rank
27	Chooses his sentences carefully to attract others	3.54	1.067	High	24
28	Calls his listeners with their names	3.49	1.018	High	5
29	Gives his opinion and comments even if not required	3.49	0.937	High	20
30	Enjoys sitting for a long to achieve his goals	3.43	0.677	High	33
31	Criticizes behavior, but not personality	3.4	0.954	High	31
32	Concludes his speech with sentences like enjoyed talking to you	3.31	1.034	High	10
33	Quickly stops discussions that don't interest him	2.66	0.9	Medium	23
34	Busy himself drawing on paper while talking to the other party	2.44	0.879	Low	12
35	Better evaluates topics after speech is over	2.40	0.847	Low	16
36	Jots down notes through talk to help in discussion later	2.30	0.837	Low	15
	Total	3.60	0.632	High	

principle, in addition to the importance of negotiation for the student as it helps achieve good relations with colleagues and staff members. Such a thing is reflected in students' achievements.

This finding agrees with that of Ibn Jahlan (2009). Where items (34, 35 and 36) obtained a low rank with the following means (2.44, 2.40, 2.30) respectively. This might be attributed to the difficulty of practising these items because they need high communication skills through evaluation and taking notes. The students care for subjects other than these in the verbal communication process, especially in listening which stands as an obstacle in the process of communication.

Table 7 Test results by the gender variable (N = 136)

Gender	Sample	Arithmetic mean	Standard deviation	Deviation error	Degree of practice	(T) value	Statistical function
Male	69	3.80	66.12	4.55	145	8.77	0.642
Female	67	3.75	76.12	12.22	52.70		

4.2 Results of to the Second Question

"Are there differences with the From Possession of faculty members and students of communication skills and their reflection on achievement in Saudi universities (a ≥ 0.05) which might be attributed to social category?

The test was used to explain the differences between the two viewpoints of staff members which might be attributed to the social variable of the aforementioned students.

Table 7 reveals that there were differences with statistical significance at the function level (a ≥ 0.05) between degrees of sample members attributed to social category. Male means were (3.80), while females were (3.75) (T) value was (8.77) and the function level (0.642), a value of statistical significance because (T) value at 134 degrees of freedom when (t) test is calculated for two unequal samples was (1.96) at the level (0.05) according to which the (t) value was considered functional.

5 Conclusion

The researchers concluded the following findings:

1. The degree of students' practices of verbal communication skills from the perspective of staff members in all items was similar except for four of them; means ranged between (2.30 and 4.22).
2. There were no statistical differences at the function level (a ≥ 0.05) for the variable of social category from the perspective of staff members.
3. There were differences with statistical differences in students' inclinations attributed to the academic department in favour of self-development with an arithmetic mean (3.94) and a statistical level (a ≥ 0.05)
4. There were no differences with statistical significance at the function level for staff members' answers attributed to the experience variable.

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6 Recommendations

In light of the findings, the researcher recommends the following:

1. Giving more attention to communication skills, for students in all departments
2. Holding courses for students to acquire more skills that benefit them in their academic and practical life
3. Conducting future studies which focus on motivating students to attend conferences and training workshops in the field of self-development
4. Conducting more studies on communication skills and self-development
5. Training students on communication skills and on how to positively deal with their instructors.

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Effectiveness of Supportive Services on Academic and Social Development of Students with Disabilities

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Abstract The aim of the current study is to identify supportive services' effectiveness on the academic and social development of students with disabilities at special education centers in Jordan from teachers' and parents' perspectives. The sample of the study consisted of (106) special education teachers, and (106) parents. To achieve the study objective, the supportive services and the academic and social development questioners were used. The results of the study revealed that the level of the supportive services provided to students with disabilities, as well as their academic and social development, was moderate from teachers' and parents' perspectives. Furthermore, a statistically significant positive correlation was found between the total score of

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_23

supportive services provided to students with disabilities and their academic and social development. In light of the results, the study recommends providing advanced levels of counseling and physiotherapy services for students with disabilities.

Keywords Supportive services · The academic and social development · Special education centers · Students with disabilities

1 Introduction

Gürgür et al. (2016) report that students with disabilities have cognitive, social, and emotional problems in addition to encountering many difficulties related to communication and language acquisition. This confirms the need to provide customized programs and services supporting their needs. According to the nature and severity of the disability, problems facing students with disabilities vary. Some cases may require the provision of short/long-term special and intensive services to develop their communication skills, speech, language, and their self-care (Hebbeler and Spiker, 2016). Due to the difficulties, they face in their academic, social and other various skills, students with disabilities need special services, especially in case of severe disability affecting their performance, even though they may have appropriate intellectual and mental skills. In view of the increasing number of children with disabilities, it is necessary to focus on providing them with supportive services address the problems they face in the academic, linguistic, mobility, developmental, emotional and social aspects, and to develop programs and services providing them with academic and social skills (Khasawneh, 2013).

Different bodies provide services to individuals with disabilities, including centers of special education, which support students with disabilities by providing various programs and services enabling them to acquire the necessary skills and knowledge to manage their disability and the problems they encounter (Din and Muhammad, 2020). Supportive services as contended by Kelly-Hall (2010) are among the services provided by special education centers for students with disabilities. These include the programs that provide students opportunities for achieving academic development and success and equip them with the necessary skills for continuing their education. These programs are defined as a set of services provided to students with disabilities on an ongoing basis targeting developing their skills and providing them with learning through special centers and within specified hours, or through specialists of special education centers providing home services, or through official affiliated-government bodies (Thombson et al., 2014). Furthermore, supportive services are considered among the means provided to students from specific groups in society to help them academically through directing them towards obtaining education, developing their skills and creating the suitable conditions according to their health and physical situation. Students are also supported through enabling them to acquire numeracy, language.

The Act of "Education of All Handicapped Children" indicated that the supportive services are the means used to provide children with disabilities with special educational services and the consequent services required for overcoming the difficulties and obstacles they face within the educational process (Zettle and Ballard, 2015). Special education centers have a key role in granting students with disabilities the right to learn through enhancing their cognitive and academic aspects; developing specialized educational programs based on technology; and equipping them with the necessary social and emotional skills enable them to interact with their families, teachers, peers, and society members. Thus, their present and future perceptions about life would be positively changed (Cheng and Lai, 2020).

Due to being one of the most important rights that should be secured for all children, many local and international bodies have been interested in securing the right of individuals with disabilities to help them obtaining their full rights, including the right to receive education. Academic development refers to an individual's excellence in a specific academic field to obtain expertise in a particular discipline through the physical efforts and interaction with curricular and extracurricular activities (Alsharari and Alshurideh, 2020; Alshurideh et al., 2021, 2021a). It also refers to an individual's acquisition of a number of qualities, such as self-confidence and punctuality that would help him in achieving the academic excellence (Al Kurdi et al., 2020a, 2020b; Alshurideh et al., 2019, 2019a; Merghany and Ibrahim, 2020).

Students with disabilities' enrollment in special education centers provides them the opportunity to learn, interact and learn new skills and techniques helping them to face the problems they encounter, contributing therefore to their academic and social development. Academic development is related to students' ability to develop their academic performance through providing the means and tools that help them develop their thinking and analysis skills, and their ability to organize time and concentrate on how to overcome the educational problems they encounter (AlHamad et al., 2021; Al-Hamad et al., 2021; Al-Maroof et al., 2021, 2021a; Grzegorz et al., 2017; Leo et al., 2021).

Students with disabilities' academic level is best developed by: ensuring the provision of various and appropriate teaching methods commensurate with the nature and severity of their disability; providing materially and morally appropriate resource rooms; providing electronic devices, programs and computers supporting their education process; providing the service of recording lectures on their devices; and ensuring specialists' and teachers' competency in helping students with disabilities develop their skills, obtain information and overcome the problems they encounter in the programs offered to them (Ahmad, 2017; Akour et al., 2021; Alshurideh et al., 2020).

Supportive services play an important role in promoting students with disabilities' academic development, during which programs and services, that help students to self-organize their knowledge, are provided through teaching them the skill of planning, controlling efforts and lifelong learning.

Social development of students with disabilities is important to enhance their self-value and self-concept. Integrating students with disabilities within the educational process, and the provision of appropriate educational programs contributes to enhancing their communication with their peers, teachers and specialists (Alshurideh

et al., 2019b; Kurdi et al., 2021). In the resource rooms, teachers receive training and specialized courses on how to develop students with disabilities at different aspects, including the social one, through which students' behavioral patterns are modified, and an adequate counseling is provided to be able to control the different emotions and situations they encounter (Bettayeb et al., 2020; Leyser and Krick, 2007).

Social development has a main role in developing students with disabilities' skills related to building relationships and making friends through preparing them to deal with the real world; making them more accepting of diversity and difference between them and others; reinforcing their self-worth sense; influencing their emotions; changing their misbehaviors; and helping them to understand the problems they encounter (Amarneh et al., 2021; Dababneh, 2016). Students with disabilities are socially developed through the provision of recreational activities, through which they acquire communication skills, interact and cooperate with their peers and others as they complete a certain activity, develop their individual skills, and learn how to control their emotions (Ashal et al., 2021; Hilbert, 2014).

Furthermore, the supportive services also contribute to increasing the social interaction between students with disabilities and their peers with/without disabilities, in addition to enhancing their feeling that they have an effective role in society, and that they are able to attain achievements. Thus, differences between them and others would be reduced, in addition they will be more self-confident, more self-esteem, more acceptance to their disability and able to handle different problems and circumstances. Consequently, supportive services have a key role in achieving students with disabilities' social development (Hassan et al., 2017; Khasawneh et al., 2021a, 2021b).

In addition to the above, the supportive services also have a role in enhancing students with disabilities' verbal skills through the speech-language services and psychological counseling, increasing therefore their ability to understand others, and their verbal and behavioral communication as well. Thus, the supportive services affect the social development of students with disabilities and help them to control their emotions and achieve compatibility between their ideas and skills through structured and continuous training (Obeid and Al-Hadidi, 2018).

Given the above, supportive services are programs depend on a group of parties determining a student's status and his/her needs to have specific support and skills in order to be able to benefit from special educational programs, during which skills and experiences are developed to help them build social relationships and learn in a way suits the nature of their disability. Supportive services also include the parents' participation in activating these services, following them up at home and making notes to teachers and specialists in order to develop these services continuously, and keep pace with students with disabilities' needs of for academic and social development (Aljumah et al., 2021; Alwan and Alshurideh, 2022).

The Ministry of Education has sought to implement programs and plans related to students with disabilities' development; ensure the availability of qualified staffs; provide supportive and educational services; and ensure their development socially, intellectually and academically (Ministry of Education, 2015).

Students with disabilities' academic and social development depends on teachers' attitudes and their inclination to interact with them, and their ability to effectively implement the supportive services in a way ensuring the achievement of educational programs' objectives that are designed for this category of students. Providing the appropriate services to students with disabilities, preparing teachers and taking advantage of specialists in this field enhances teachers' ability to deal with students. It also makes them acquainted with the difficulties facing students and the required efforts to increase supportive services effectiveness in developing students' academic and social aspects (Alshamsi et al., 2020; Kang and Martin, 2017).

A study (Mulvey et al., 2016)of reported that teachers, with regard to students' existence within an educational environment, usually focus on the academic aspects, regardless the obstacles that hinder their progress and acquisition of knowledge. Students with disabilities situation differ according to the nature and severity of their disability, as it affects their response towards the educational programs and the provided curricula. It also reported that teachers do not focus on the social and emotional environment surrounding students with disabilities, which is considered a factor affecting students with disabilities' success and failure in life, compatibility with the surrounding community, and their acquisition of knowledge.

There are several studies examining the supportive services and the academic and social development, and the relationship between them. A study (Mohammad and Arafa, 2015), in Saudi Arabia, assessed the supportive services provided to students with special needs from faculties and supervisors' perspectives and their own perspectives as well among a sample of (13) male and female students with special needs from Majmaah University and (52) faculty members and supervisors from the Department of Special Education. The level of supportive services provided to students with special needs was "moderate", and that there were statistically significant differences in the level of supportive services provided to students with special needs from students' perspective, due to the gender, and in favor of males. (Gürgür et al., 2016) examined the effectiveness of the supportive services provided to students with hearing impairment at Turkey special education centers from the teachers' perspectives. The results also showed that there are, from the teachers' perspectives, some difficulties in providing supportive services, represented by the practical aspects, reports of special education centers, the time required to receive support, low levels of pre-service training and low levels of family participation.

In Saudi Arabia, (Hassan et al., 2017) examined effectiveness of supportive services on students with disabilities' social development from special education teachers' perspectives. Social development level was moderate from teachers' perspectives. There was a statistically positive correlation between the supportive services provided to students with disabilities and the development of the social and psychological skills of students with disabilities from teachers' perspectives. (Al-Blawi, 2018) investigated the effectiveness of the supportive services provided to students with hearing disabilities from their parents' and teachers' perspectives in Qurayyat city, in Jordan. The results of the study showed that the effectiveness of the supportive services was moderate from their parents' and teachers' perspectives. (Contreras et al., 2018) studied special education centers' role in the academic

development of students with disabilities in the United States. The sample of the study consisted of (23) students with disabilities. To achieve the objective of the study, a quasi-experimental design was used. The results indicated that the academic development of students with disabilities was low.

2 Problem of the Study

The problem of the study stems from the recommendations indicated by the previous studies, such as (Al-Blawi, 2018) indicating that the effectiveness of the supportive services provided to students with disabilities was low. There is a need to ensure the appropriate provision of the programs and services that develop the intellectual and academic aspects of students with disabilities. As for the study (Din and Muhammad, 2020), it indicates that there are certain problems in the educational process of students with disabilities at special education centers, which came as a result to some problems in teachers' competence, in addition to the nature of the strategies used in teaching students with disabilities.

According to the researchers' field experience in Special Education, a lack in the supportive services provided to students with disabilities were observed, despite their importance in developing several social, behavioral and academic aspects. For example, the studies (Contreras et al., 2018; Hassan et al., 2017) confirmed that the provision of the supportive services can develop the academic and social aspects of students with disabilities regardless of the type and severity of their disability. This implies the importance of providing supportive services for this group of students, indicating a need to examine their impact on their various psychological and emotional aspects. According to the researchers' revision of previous literature related to special education, a clear knowledge gap was observed, as there is a scarcity of studies addressing the effectiveness of the supportive services on the academic and social development of students with disabilities. Thus, the researchers considered that there is a need to conduct a study identifying the nature of this effect. From the above, the problem of the current study stems from answering the following questions:

1. What is the level of the supportive services provided to students with disabilities in special education centers from their teachers' and parents' perspectives?
2. What is the level of academic and social development of students with disabilities at special education centers from their teachers' and parents' perspectives?
3. Is there a correlation between the supportive services and the academic and social development of students with disabilities at special education centers from their teachers' and parents' perspectives?

3 Significance of the Study

The importance of the current study stems from the fact it can shed light on the role of supportive services in developing students with disabilities academic and social skills. It is also hoped that this study will enable decision makers in the educational field in Jordan to identify the quality of the supportive services provided to students with disabilities, and the quality of other services that should be provided to them.

Definitions of Terms

Supportive services: A set of services provided to students with disabilities inside or outside the educational institutions to enable them getting benefit from the educational programs provided to them, including health, psychological, counseling, physical therapy, transportation, language and speech therapy, and other necessary services (Ahmad, 2017).

Academic development: Students' ability to develop their academic performance through the provision of means and tools help them develop their skills related to thinking, analysis, and ability to organize time and overcoming the educational problems they encounter within the educational process (Grzegorz et al., 2017).

Social development: Students' ability to develop their practices and behaviors in a way enabling them to achieve the adjustment with their peers and achieve balance and psychological stability through improving their ability to address problems, and control feelings of anxiety, depression and instability (Dessemontet and Bless, 2011).

4 Method and Procedures

To achieve the objectives of the study, descriptive analytical design was used, by collecting information related to the study and analyzing it to get the results that will help in understanding and developing the educational environment.

4.1 Study Sample

The study sample consisted of (106) special education teachers in addition to (106) parents. These were randomly selected from different geographic regions in Jordan.

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4.2 Supportive Services Scale

The scale was developed by reviewing a set of previous studies such as (Alquraini, 2007; Alshamsan, 2008). The scale consisted in its primary format of (30) items distributed on (4) domains: Speech and language therapy services (7 items); occupational therapy services (8 items); physical therapy services (8 items); counseling services (7 items). To check the scale face validity, content validity was verified by asking (11) experts to give their remarks concerning the items suitability and adding any other appropriate item. (80%) of the proposed amendments by the juries were taken into consideration. The scale in its final format consisted (26) items distributed on (4) domains: Speech and language therapy services (6 items); occupational therapy services (6 items); physical therapy services (8 items); counseling services (6 items). Construct validity was verified by calculating correlation coefficients between the items and their domains were calculated through a pilot sample consisted of (20) parents and (20) special education teachers. Correlation coefficient of each item was calculated, as the correlation value indicates validity significance for each item since it indicates the correlation value between the item and the total score from one hand and between each domain and the total score on the other hand. The correlation coefficient ranged between (0.67–0.40), all values were larger than (0.20) which considered accepted for the purposes of the current study. It also can be noted that all correlation coefficients values were statistically significant and accepted for the purposes of this study. Scale reliability was checked using Test–Retest through a sample consisted of (20) parents and (20) special education teachers selected from the same population and out of the original sample. The scale was administrated and re-administered on the same sample after two weeks. Then, Pearson's Correlation Coefficient factor was calculated between their responses in both times. After that, Internal Consistency using Cronbach's Alpha was calculated for the sample scores on the first administration, Internal Consistency value was (0.815) which is a high coefficient indicating that the scale enjoys a high and acceptable stability coefficient, as seen in Table 1.

Table 1 Cronbach's alpha and person's correlation coefficient and the total score for the supportive services scale

Domain	Person correlation coefficient	Cronbach alpha
Speech and language services	0.903	0.831
Occupational therapy services	0.900	0.823
Physical therapy services	0.882	0.853
Counseling services	0.847	0.849
Total	0.888	0.815

4.3 Academic and Social Development Scale

The scale was developed by reviewing a set of previous studies such as Alquraini (2007), Dessemontet and Bless (2011), Grzegorz et al. (2017). The scale consisted in its primary format of (24) items distributed on (2) domains: Academic development (14 items) and social development (10 items). To check the scale validity, content validity was verified by asking (11) experts to give their remarks concerning the items suitability and adding any other appropriate item. (80%) of the proposed amendments by the juries were taken into consideration. The scale in its final format consisted (26) items distributed on (4) domains: Speech and language therapy services (6 items); occupational therapy services (6 items); physical therapy services (8 items); counseling services (6 items). Construct validity was obtained via calculating correlation coefficients between the items and their domains were calculated through a pilot sample consisted of (20) parents and (20) special education teachers. Correlation coefficient of each item was calculated, as the Correlation Coefficient value indicates validity significance for each item since it indicates the Correlation Coefficient value between the item and the total score from one hand and between each domain and the total score on the other hand. The Correlation Coefficient ranged between (0.71–0.43), all values were larger than (0.20) which considered accepted for the purposes of the current study. It also can be noted that all Correlation Coefficient values were statistically significant and accepted for the purposes of this study. Scale reliability was obtained using Test–Retest through a sample consisted of (20) parents and (20) special education teachers selected from the same population and out of the original sample. The scale was administrated and re-administered on the same sample after two weeks. Then, Pearson's Correlation Coefficient was calculated between their responses in both times. After that, Internal Consistency using Cronbach's Alpha was calculated for the sample scores on the first administration, Internal Consistency value was (0.823) which is a high coefficient indicating that the scale enjoys a high and acceptable stability coefficient, as seen in Table 2.

Table 2 Cronbach's alpha and person's correlation coefficient and the total score for academic and social services scale

Domain	Person correlation coefficient	Cronbach alpha
Academic development	0.892	0.841
Social development	0.880	0.829
Total	0.922	0.823

5 Results

5.1 *Results of the First Question: "What is the Level of the Supportive Services Provided to Students with Disabilities in Special Education Centers from Their Teachers' and Parents' Perspectives?"*

To answer this question, means and standard deviations were calculated for the level of supportive services provided to students with disabilities in special education centers from their teachers' and parents' perspective, as shown in Table 3.

Table 3 shows that the level of supportive services provided to students with disabilities in special education centers from their teachers' perspectives was moderate (M = 3.30, Std. Devi. = 0.490). Means of the scale domains ranged between (3.04–3.52) with a moderate level. Speech and language services domain ranked first (M = 3.52, Std. Devi. = 0.649) with a moderate level, while counseling services ranked last (M = 3.04, Std. Devi. = 0.774) with a moderate level.

Furthermore, the level of supportive services provided to students with disabilities in special education centers from their parents' perspectives was moderate (M = 3.25, Std. Devi. = 0.402). Means of the scale domains ranged between (2.97–3.77) with a moderate level. Speech and language services domain ranked first (M = 3.77, Std. Devi. = 0.703) with a moderate level, while physical therapy services ranked last (M = 2.97, Std. Devi. = 0.471) with a moderate level.

Table 3 Means and standard deviations for the level of supportive services provided to students with disabilities in special education centers from their Teachers' and Parents' perspective

No	Domain	Teachers' perspective		Parents' perspective		Level
		Mean	Std. Devi	Mean	Std. Devi	
1	Speech and language services	3.52	0.649	3.77	0.703	Moderate
2	Occupational therapy services	3.29	0.771	3.19	0.733	Moderate
3	Physical therapy services	3.34	0.681	2.97	0.471	Moderate
4	Counseling services	3.04	0.774	3.17	0.687	Moderate
Total		3.30	0.490	3.25	0.402	Moderate

Table 4 Means and standard deviations for the level of academic and social development of students with disabilities in special education centers from their Teachers' and Parents' perspective

No	Domain	Teachers' perspective		Parents' perspective		Level
		Mean	Std. Devi	Mean	Std. Devi	
1	Academic development	2.97	0.510	3.08	0.479	Moderate
2	Social development	3.31	0.588	3.17	0.470	Moderate
Total		3.15	0.420	3.12	0.364	Moderate

5.2 *Results of the Second Question: "What is the Level of Academic and Social Development of Students with Disabilities' at Special Education Centers from Their Teachers' and Parents' Perspectives?"*

To answer this question, means and standard deviations were calculated for the level of academic and social development of students with disabilities in the special education centers from their teachers' and parents' perspective, as shown in Table 4.

Table 4 shows that the level of academic and social development of students with disabilities in special education centers from their teachers' perspectives was moderate (M = 3.15, Std. Devi. = 0.420). Means of the scale domains ranged between (2.97–3.31) with a moderate level. Social development domain ranked first (M = 3.31, Std. Devi. = 0.588) with a moderate level, while counseling services ranked last (M = 2.97, Std. Devi. = 0.510) with a moderate level.

Furthermore, the level of academic and social development of students with disabilities in special education centers from their parents' perspectives was moderate (M = 3.12, Std. Devi. = 0.364). Means of the scale domains ranged between (3.08–3.17) with a moderate level. Social development domain ranked first (M = 3.17, Std. Devi. = 0.470) with a moderate level, while academic development domain ranked last (M = 3.08, Std. Devi. = 0.479) with a moderate level.

5.3 *Results of the Third Question: "Is There a Correlation Between the Supportive Services and the Academic and Social Development of Students with Disabilities at Special Education Centers from Their Teachers' and Parents' Perspectives?"*

To answer this question, Correlation Coefficients was calculated between supportive services and academic and social development of students with disabilities at special education centers, as follow.

Table 5 Pearson correlation coefficient between supportive services and academic and social development of students with disabilities in special education centers from Teachers' perspectives

Sample	Domains		Academic development domain	Social development domain	Total score of development
Teachers	Speech and language services	Correlation coefficient	0.378**	0.120	0.311**
		Sig.	0.000	0.219	0.001
		Sample	106	106	106
	Occupational therapy services	Correlation coefficient	0.202*	0.430**	0.419**
		Sig.	0.038	0.000	0.000
		Sample	106	106	106
	Physical therapy services	Correlation coefficient	0.082	0.559**	0.456**
		Sig.	0.404	0.000	0.000
		Sample	106	106	106
	Counseling services	Correlation coefficient	0.170	0.205*	0.254**
		Sig.	0.082	0.035	0.009
		Sample	106	106	106
	Total score	Correlation coefficient	0.286**	0.506**	0.535**
		Sig.	0.003	0.000	0.000
		Sample	106	106	106

Table 5 shows that there is a statistically positive correlation at ($\alpha = 0.05$) between the total score of supportive services and academic and social development of students with disabilities at social education centers from teachers' perspectives (Correlation Coefficient = 0.535**, Sig. = 0.000)

5.4 *Teachers' Perspective*

Correlation Coefficient was calculated between supportive services and academic and social development of students with disabilities at special education centers from teachers' perspectives, as shown in Table 5:

5.5 *Parents' Perspective*

Correlation Coefficient was calculated between supportive services and academic and social development of students with disabilities at special education centers from parents' perspectives, as shown in Table 6.

Table 6 Pearson correlation coefficient between supportive services and academic and social development of students with disabilities in special education centers from parents' perspectives

Sample	Domains		Academic development domain	Social development domain	Total score of development
Parents	Speech and language services	Correlation coefficient	0.355**	0.201*	0.364**
		Sig.	0.000	0.039	0.000
		Sample	106	106	106
	Occupational therapy services	Correlation coefficient	0.243*	0.248*	0.320**
		Sig.	0.012	0.010	0.001
		Sample	106	106	106
	Physical therapy services	Correlation coefficient	0.079	0.510**	0.382**
		Sig.	0.421	0.000	0.000
		Sample	106	106	106
	Counseling services	Correlation coefficient	0.103	0.122	0.147
		Sig.	0.001	0.000	0.000
		Sample	106	106	106
	Total score	Correlation coefficient	0.314**	0.417**	0.477**
		Sig.	0.001	0.000	0.000
		Sample	106	106	106

Table 6 shows that there is a statistically positive correlation at ($\alpha = 0.05$) between the total score of supportive services and academic and social development of students with disabilities at social education centers from parents' perspectives (Correlation Coefficient = 0.477**, Sig. = 0.000).

6 Discussion

The study results showed that the level of the supportive services provided to students with disabilities in special education centers from their teachers' perspectives was moderate. This finding can be explained by the fact that special education centers do not have the adequate resources to provide supportive services. Additionally, the nature of the supportive services needs human resources of workers, specialists and counselors, which means that there is a need to provide many financial resources to attract and employ them and this is what special education centers lacks. This result can also be explained by the fact that the supportive services are diverse, numerous, and differ according to the nature of the disability that the child suffer from; this dictates to train the specialists in various disciplines in order to offer high-quality supportive services. Furthermore, the results showed that the level of the supportive services provided to students with disabilities in special education centers

from their parents' perspectives was moderate. It can be explained by the fact that the parents of students with disabilities are aware of the importance of supportive services, the need for them in order to ensure better education for the students, and the ability to develop a set of motor and performance skills, which can help in evolving their performance even though their level was moderate. Besides, parents are well informed about the difficulty of providing supportive services by special education centers which lack the adequate material and human resources capable of providing this type of services. This result can be also explained by the fact that PWD Act of the Government of Jordan emphasized the importance of providing the highest level of supportive services for the parents of individuals with disability to enable them to provide a closer to normal environment for their children. Furthermore, private enterprise become aware about the importance of serving individuals with disabilities and their parents and that encouraged many investors to establish private enterprises concerned with providing residential and supportive services for individuals with disabilities. Additionally, the workers in public and private enterprises which focus on individuals with disabilities have sufficiency, knowledge and experience that enable them to understand the importance of supportive services for the parents of individuals with disabilities to help them to provide a normal environment for their children. This result is consistent with the results of Mohammad and Arafa (2015) study, which showed that the level of supportive services for students with disabilities was moderate. It is also consistent with the results of Al-Blawi (2018) study which showed that the level of supportive services for students with hearing disabilities was moderate from parents and teachers' perspectives.

Additionally, the results of the study indicated that the level of academic and social development of students with disabilities at special education centers from teachers' perspective was moderate. This result can be explained by the fact that teachers are aware of the importance of improving students academically and socially, this makes them look positively at any academic or social improvement achievement by the child with disability. Also, the contribution of supportive services in academic development is conditional on the capacity of the special education center to provide the best level of supportive services, which dictates that the center should provide great human potentials from specialists in different disciplines, in addition to providing the necessary infrastructure. Therefore, if the supportive services properly supplied, they would contribute significantly in achieving academic and social improvement for the child with disability; as they help him to adapt with the nature of his disability through what they provide of environmental adaptations capable of meeting this child needs. Merghany and Ibrahim (2020) confirmed that the effectiveness of the programs provided to students with disabilities in special education centers is influenced by the level of quality commitment in the delivery of such programs, and their compatibility level with global criteria and indicators designed to implement these programs. Therefore, this result can be explained by the fact that teachers are aware of the importance of achieving academic and social development; however their awareness level about the criteria and indicators could be one of the factors affecting planning and management processes, providing an appropriate educational environment for students, and implementing programs adequately. This

means that teachers seek to improve the level of supportive services as they are aware of their importance in helping child with disability in achieving higher levels of academic and social improvement. As if working on providing supportive services contributes significantly to help child with disability in understanding the nature of his disability and employing his skills and potentials to achieve higher levels of life works. This result can be due to those teachers in special education centers use the different teaching methods however they are limited. Din and Muhammad (2020) emphasizes that teachers ability on defining the adequate teaching methods for the student with disability increases the ability of achieving significant academic improvement. Consequently, teachers may not tend to diversify teaching methods, and not tend to innovate extensively, which requires ensuring that teachers are trained before and during service and ensuring that the programs and electronic services are which enhance the students' academic level are available. The results also found that the level of academic and social development of students with disabilities at special education centers from parents' perspective was moderate. This result can be explained by the fact that parents watching their children with disabilities daily and notice the level of academic and social improvement they can achieve by using the provided supportive services in special education centers. Also, their experience with the child with disability made them seek for better levels of services, which made them able to provide substantive provisions concerning supportive services ability on achieving academic and social development for the child with disability. It also can be contended that parents are more aware about the nature of the provided supportive services for their children with disabilities, and this makes them make relatively good judgments concerning the level of these services and their ability to meet some basic needs of the child with disability. Moreover, parents want to get more information about the different services they can offer for their children that can help them to overcome some functional problems that they face due to their disability. The result is consistent with the results provided by Hassan et al. (2017) study which found that the level of social development was moderate among students with disabilities from teachers' perspectives. While it differs from Contreras et al. (2018) study which found that the level of academic development was low among students with disabilities.

In addition, a positive significant correlation was found between supportive services and academic and social services for the students with disabilities in special education services from teachers' and parents' perspectives. This result can be explained to the fact that working on providing supportive services is an indicator that public and private educational enterprises take into consideration the importance of supportive services and their role in achieving academic and social development for the children with disabilities. Furthermore, providing services such as speech and language therapy services, occupational therapy services, physical therapy services, and counseling services contribute significantly in helping children with disabilities to adapt with the nature of their disability and employing their skills, and their mental and physical abilities in achieving higher levels of academic and social improvement. Also, the academic needs of students with disabilities are vary from normal students; as the fact of just providing books and school friendly facilities for students with

disabilities does not mean their positive effect of the academic aspects; there is a need for providing supportive services able to help students with disabilities to live relatively normal through these services contribution in making them more willing to live a normal life, which means that they are able to reach relatively acceptable levels of academic achievement and to live a relatively normal social life; and this means that providing supportive services is related significantly to helping children with disabilities in achieving academic and social development.

7 Recommendations

In light of the results, the study recommends providing advanced levels of counseling and physiotherapy services for students with disabilities. Also, there is a need to create the optimal conditions to achieve the academic and social development of students with disabilities, such as preparing school and special education institutions to receive them. Moreover, additional light should be shed on conducting more studies addressing the effectiveness of the supportive services on other variables, such as parents' mental health and students with disabilities' social skills.

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The Effectiveness of the Performance of Principals of Basic Education Schools in the Sultanate of Oman in Managing Change in Light of the Corona Pandemic

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Abstract The current study aimed to identify the effectiveness of the performance of principals of basic schools, the first cycle, in change management in light of the Corona pandemic. The researcher used the descriptive-analytical method. A questionnaire was applied to (400) male and female teachers. The effectiveness of the principals' performance for change management fields was as follows: Follow-up and implementation ranked first with a mean (3.83), followed by planning (3.73), and evaluation (3.60). The study showed that all the statements of the three axes regarding the effectiveness of the performance of principals of basic education in the axes of change management came to a high degree, except one item in evaluation axe "Item 3", which reads (the principal focuses on evaluating qualitative performance and neglects quantitative performance). The study showed statistically significant differences at the significance level (0.05) in all fields in favour of females. The study also indicated that there were no statistically significant differences between the means due to the academic qualification variable. The researchers recommended that the Ministry of Education should adopt the change project for all school principals in its plans as a basic project in its organizational structure.

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_24

Keyword Change management · Al Dakhiliyah and Eastern Governorates · Corona Covid 19 pandemic

1 Introduction

The world is witnessing rapid changes and transformations in all aspects of scientific and practical life, whether at the economic, social, cultural, or political level. Therefore, various international institutions have faced several challenges represented in the requirement to bring about innovative change (Nuseir et al., 2021a; Alzoubi et al., 2022;Alameeri et al., 2021). The nature of life in this era requires these institutions to be strong and able to show unique competition. Indeed, this only comes through the perfect competencies of quality and excellence. Despite the rapid and significant development performed by the various institutions on dealing with the change in the work environment, these efforts are still confined to a very narrow field (Alshurideh et al., 2019a; Alameeri et al., 2021; Nuseir et al., 2021b). In a time of high competition and institutional and technological change, the emergence of methodologies for managing change and its multiple theories has contributed to the provision of many advanced modern administrative applications with scientific and practical foundations that institutions adopt as a kind of guidance for solving various organizational problems within the institution (Almaazmi et al., 1261; Al Suwaidi et al., 2021; Tariq et al., 2022a). Integration of change methods plays a vital role in creating and coordinating modern organizational initiatives (Hayajneh et al., 2021). Working to develop a culture and approach to change within institutions necessitates several activities, the most important of which is focusing on making radical and fundamental changes in many effective administrative systems that have a significant impact on human forces in terms of their scientific and technical skills, as well as proposing policies concerning the implementation of work within the institution and the creation of organizational policies (Shehata, 2021; Abuhashesh et al. 2021; Odeh et al., 2021).

The process of change is not limited to private organizations and businesses, but also to scientific and educational institutions, which are under a lot of pressure to change because they are in charge of the education process and its development, as well as working to modernize its educational processes (Kurdi et al., 2020a; Kurdi et al. 2020; Alshurideh, et al., 2021). Whereas the educational process is the first basic pillar of the educational process to which the teaching and learning processes are entrusted, it is what is relied on to perform a lot of work and organizations for this process. As a result, it is difficult for these educational institutions to adapt to change. They and their leaders must experience numerous significant challenges during the change process. However, successful educational leaders and educational institutions are the ones who can overcome the challenges of managing change (Al-Wasmi, 2006; Alshurideh et al., 2020; Akour et al., 2021).

Al-Azzam (2016) claims that to ensure that these institutions play an active and entrusted role in the development of society and the revitalization of the economy, education, and culture in the current era, all of the various educational institutions

throughout the Arab world must apply and use the management of change and excellence that is appropriate for this age. However, if these institutions adopt relevant regulations and trends in response to the world's development in its different disciplines, they will be capable to boost their levels of innovation and institutional creativity in the fields of education. Change has become a feature of the era that requires a lot of human, material and intellectual costs. Therefore, when change occurs, it will seek to achieve many lofty goals, including the following as mentioned by Jilali and Ali (2019): working on establishing models for openness in the organization from employees to handle all of the institution's problems directly, and to offer an acceptable climate for them based on trust and good treatment among them. In addition to working on developing complementary relationships among employees within the organization as individuals and groups to encourage competition, innovation, and team spirit, which will lead to motivating them and increasing their confidence and interaction in the work they perform (Al Kurdi et al., 2020; Al Kurdi et al., 2020b; Alshurideh et al., 2019b).

Change necessitates deliberate and empowered leadership (AlShehhi et al., 1261). The inspired and willing leaders to manage change in the new twenty-first century, whose primary goal is to contemplate the change process, continually look for potential chances for change, and try to generate change in a novel and successful method within educational institutions (Al-Dhuhouri et al., 1261; Harahsheh et al., 2021; Alshurideh et al., 2019c). This necessitates some serious steps, the most important of which are: working on developing future-oriented policies, searching for modern methodologies for the processes of searching for and anticipating the type of change, searching for the best appropriate methods for introducing the change process inside and outside the institution, and developing modern scenarios to find various policies to ensure a balanced process of change.

Just as change is closely related to the administrative and technical structure within educational institutions, leaders must have viable plans within their institutions, not just a written future vision. It is necessary to work well and participate with other employees in delegating powers and empowering you, as this will give a strong impetus towards the process of change within educational institutions, especially on the part of employees, making them think about issues that affect the educational aspect. Thus, the principle of participation with leadership in the process of change will be activated in many aspects. Also, the growth of the technological aspect within educational institutions forced them to take many practical steps towards this aspect, including transparency towards accountability in the processes of attendance, absence, dereliction of work, and…etc. Change management is one of the most successful administrative trends, where most of the employees or the organization are transferred to hoped-for drawings and strategies in the future if the goal of change is to ensure the success of the institution and achieve the best results at the regional and global levels and work to provide an appropriate climate for all workers in those institutions without any pressure. Therefore, many studies have dealt with the accountability of change management as it is a followed and basic approach to the process of developing institutions of all kinds (Al Batayneh et al., 2021; Alshurideh,

2022; Tariq et al., 2022b). Among the studies that dealt with change management are the following:

The study of Al-Muslat (2021), aimed to explore the role of the educational supervisors' practice in change management and its relationship to teachers' job commitment in secondary schools in the Asir region. The researcher adopted the descriptive-analytic approach. A questionnaire was applied to a sample (n = 341) of male and female teachers. It was found that the educational supervisors practice their role in change management to a high degree with a mean of (3.38). Teachers' job commitment came to a high degree with a mean of (4.22). No statistically significant differences were found regarding the mean degree of the educational supervisor's practice of their role in the change management process and the mean job commitment of teachers attributed to the variables: specialization - practical experience - location. The study also indicated that there was a kind of positive correlation between the role that plays. The educational supervisor in change management showed the average degree of job commitment (Allozi et al., 2022; Alketbi et al., 2020; Alshurideh et al., 2017).

The study of Shehata (2021) aimed to identify the availability of organizational change processes, knowledge and reality of institutional excellence within institutions, and to identify the strategic dimensions of the training and sustainable development process in various commercial banks in the Republic of Egypt. (107) employees participated in the study. The findings showed a positive relationship effect in the process of organizational change on the applied strategy for the training and development processes, as well as the existence of a relationship with a positive impact on the quality of training and development in institutional excellence. The result also revealed that the applied strategy for the process of training and development has an active role in the partial mediation process in the relationship of the process of organizational change and institutional excellence and that there were significant differences in the impact of the organizational change process on the existing strategy and practice in training and development.

Al-Otaibi and Al-Anzi (2021) sought to identify the terms of change management and its multiple concepts, as well as the practical and theoretical importance within educational institutions.. The researcher used the analytical method. After reviewing and analysing the studies and literature related to the study, the following was concluded: Change management is a philosophy that exists within the organization among the strategic plans scheduled to be achieved in one of the aspects within the organization to increase the effectiveness of the organization and work to achieve the required balance. Also, organizational loyalty is one of the biggest factors affecting the effectiveness and production of the institution, and it is one of the aspects that preoccupied many institutions and organizations. The study also clarified that among the reasons that prompted leaders in the State of Kuwait to adopt change management is to increase trust and positive interaction among members of the administrative leaders. Where the study of Njuguna and Muathe (2016) sought to identify the challenges facing organizations in the process of change. The researchers used the analytical method. The questionnaire was applied to a random sample of various operating institutions. The study concluded that there are great challenges

that hinder the process of managing change in institutions and that institutions must stand tall to survive and maintain their level by taking a set of basic steps that help them to do so. The study also made it clear that institutions should consider the needs of their employees, help them achieve their goals, and encourage them in various fields of work, to be able to compete with their peers in global markets. The results showed that the change management process is closely related to the human elements within the single organization to be able and successful to bring about change within the organization. The study of Hallinger (2010) aimed to explore the most important factors that enable change management and improve its ability in educational institutions by linking some leadership styles: transformational leader style, directed leader style, with their strategic role to bring about the change process within educational schools. The analytical method was employed the researcher. The study yielded the following findings: The results prove that the effectiveness of both transformational and directed leadership styles affect change inside educational institutions. It also proved that the real leader is that person who can work in the spirit of the group within his organization with all the employees working with him and is also able to ignite the spirit of enthusiasm and distribute institutional trust among the employees; To enhance organizational loyalty within the institution and thus help to bring about radical change within the educational schools.

1.1 Problem Statement

The Sultanate of Oman, like other Arab countries, seeks a continual development process in all sectors of life inside the Sultanate. Perhaps this is what was indicated in the national strategy 20/40 and the future vision for Oman 20/40, both of which have been meticulously put out. The Sultanate began deploying it in early 2021. This vision addressed major axes that affect the Omani person's life (economic, social, political, cultural). These axes include Omani society and individuals in their legal capacity, growth in all its forms and facets, performance and governance, and a clean and healthy environment. The ultimate goal of this vision is to develop all the main activities and areas so that the Sultanate enters into the various classifications in providing services and welfare to the people. And also, to compete in obtaining global indicators that prove the interest in the Omani individual and his well-being and to provide all things to lead a happy life following what is stated in international standards. And all this helped to work in bringing about some radical changes in the life matters that are practised on the ground, which showed some obstacles to achieving many things. Thus, we find that the process of change is indispensable, as it is a necessity to achieve justice, prosperity and growth. This is what was stated in the text of Sultan Haitham's speech (2020) that the next stage will be a stage of growth, progress and change in many of the issues imposed by the current challenges.

The Ministry of Education in the Sultanate of Oman make different administrative and educational changes. Among these changes were the changes of the basic education system in 1996 when it was applied to some students, then in 2006, it includes

various schools. Another change was the establishment of an online portal concerned with the educational process, which is known as the educational portal, which is one of the best innovations that keep pace with technical and technological progress. Another system was introduced, known as the educational indicators system, which is also a qualitative leap in the field of education, which diagnoses the educational process in all its aspects. In addition to the introduction of another program known as the School Management Program, which is also a qualitative leap, this was proven by many Omani studies, which emphasized the importance of change management in the Ministry of Education in the Sultanate of Oman. Among those studies are the following: The study of Al-Jaraydah (2021) which linked change management to the training needs of the Ministry of Education, and the study of Al-Ghailanih (2015) which tried to identify the perspective of the employees of the Ministry's general office in the Sultanate of Oman on managing change. And the study of Al-Ghailanih (2015) aimed to identify the degree of the practice of administrative supervisors to change management and its relationship to job satisfaction. Therefore, this study came to answer the following questions:

1. What is the effectiveness of basic school principals' role in managing change in light of the Corona pandemic from the teachers' perspective?
2. What is the order of the areas of management change according to the performance of principals of basic schools in light of the Corona pandemic, from the teachers' perspective?
3. Are there statistically significant differences at the significance level (0.005) in the effectiveness of the performance of principals of basic schools in the Sultanate of Oman in the areas of management change during the Corona pandemic due to the variable (gender, qualification)?

1.2 Study Significance

Theoretical significance: The theoretical importance of the study lies in its subject, which is the management of change, its terminology, its objectives, its importance and the necessity of its presence inside and outside educational institutions. Being an indispensable variable. The study also seeks through this work to enrich the Arabic and Omani literature with a kind of modern studies on the effectiveness of the performance of principals of basic education in the Sultanate of Oman in the areas of change management.

Practical Significance: It is represented in the results obtained through the actual application of the questionnaire, as well as in the study's recommendations to implement the change management process in educational contexts and by standing on some crucial issues. The study also aims to determine the areas and types of areas involved in the practice of change management. This is expected to assist decision-makers in the Ministry of Education in determining the most significant and appropriate main activities for their implementation.

1.3 Goals

1. Measuring the effectiveness of basic education principals' performance in the Sultanate of Oman in the areas of change management during the Corona epidemic from the perspective of teachers.
2. Identifying the order of change management areas based on the performance of basic education managers in light of the Corona epidemic from the perspective of teachers
3. Revealing if there are statistically significant differences in the efficacy of basic education school principals' performance in the Sultanate of Oman in the areas of change management during the Corona epidemic, according to the variable (gender, qualification).

1.4 Study Limitations

1. Objective limits: including change management
2. Spatial boundaries: all primary education schools in the Sultanate of Oman.
3. Time limits: 2022/2023
4. Human limits: basic schoolteachers.

1.5 Study Terminology

Basic education: It is the educational system that started in 1996 for the first time. It is the unified education provided by the government to all the children of the Sultanate of Oman who has reached school age. The duration of this type of education is ten years, during which the most important basic educational needs such as information, knowledge and skills. It works on the development of various behavioural trends and human values through which learners are enabled to continue education and training according to their readiness, inclinations and ability. This type of education aims to work in the development of individuals to face the various future challenges that may confront them (42.The Ministry of Education, 2022).

Change management: It is a continuous and comprehensive process carried out by the leader through employing all of the skills and technical expertise on leadership to make a better influence. And to bring about an effective change process in all parts of the educational institution by adapting to the course of the future vision of education, which affects the nature of employee performance (Alhamad et al., 2021; Alsuwaidi et al., 2021; Muia, 2015; Okemba, 2018) defined it as the system that facilitates the process of shifting individuals within organizations from one position to a better future position to meet the corporate strategy objectives. Alternatively, it is an organized process in which change processes are carried out to attain the best

results possible, using organized administrative procedures to accomplish the change management process.

Corona pandemic: The World Health Organization defines it as a disease that affects the human body and causes acute pneumonia, leaving traces of exhaustion, fatigue, and sometimes death, and was also known as (covid-19), which was declared by the World Health Organization as a global disease that has outbroken globally, causing a wide disaster for the entire world (AL-Hadhrami and Al Shaqsia, 2021; Al-Dmour et al., 2021a; Al-Dmour et al., 2021b; Al Khasawneh et al., 2021a; Al Khasawneh et al., 2021b).

2 Method and Procedures

The methodological procedures of the research consist of the following steps:

2.1 Study Population

The study population was selected from all categories of male and female teachers in basic education schools representing the first cycle of (1–4) in the Sultanate of Oman, which counted (15, 032) teachers according to the statistics of the Ministry of Education's statistical book for the year 2021.

2.2 Study Sample

The study sample (n = 500) teachers who were selected using the simple random method, which amounted to approximately (500) teachers and teachers, and due to the current conditions and lack of awareness, the researchers were unable to cover the representative sample of the study population.

2.3 Study Instrument:

The researcher used a five-point Likert scale, which is represented by the following five rates: (very few - few - medium - high - very high). The results were to the scale as shown in Table 1.

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Table 1 The study instrument

Mean	1–1.8	1.81–2.60	2.61–3.40	3.41–4.20	4.21–5.00
Rate	Very low	Low	Medium	High	Very high

Table 2 The instrument reliability coefficient

	Field	Items (N)	Reliability coefficient
1	Planning	9	0.80
2	Follow up and implementation	9	0.79
3	Evaluation	7	0.77
Total			0.79

2.4 Instrument Validity

The researcher developed the study instrument by referring to previous studies related to change management. The study tool was presented to 7 experienced arbitrators in the field of management. Where the initial form of the questionnaire consisted of (3) basic fields and (35) statements distributed as follows: (1) Planning including (13) statements and (2) Follow-up and implementation (15) statements and field (3) The evaluation (10) statements. All the required modifications were considered, and the tool reached in its final form (25) statements divided into the three fields of planning (9) statements, follow-up and implementation (9) statements and evaluation (7) statements.

2.5 Instrument Reliability

The instrument reliability was tested using the Cronbach alpha method. The tool was administered to a sample (n = 40) of male and female teachers from different basic schools in the Sultanate of Oman, as indicated in Table2.

Table 2 shows that the instrument reliability coefficient was (0.76), which is a high degree of reliability, and this indicates the reliability of the overall scale.

3 Results

3.1 Results of the First Question

"What is the Effectiveness of Basic School Principals' Role in Managing Change in Light of the Corona Pandemic from the Teachers' Perspective **?"**

Table 3 Descriptive analysis for the field "Planning"

	Statements	Mean	SD	Rank	Degree
1	The principal implements school plans flexibly according to changes	3.82	0.932	4	High
2	The principal follows up on the school's issues according to a set schedule	3.87	0.993	2	High
3	The principal continues to study the factors of change on the educational plan applied within the school	3.76	0.992	5	High
4	The principal considers changes in the field while setting the school schedule	3.88	1.089	1	High
5	The principal sets his school plans in light of the expected future changes	3.71	0.965	6	High
6	The principal has initiatives in developing plans to keep pace with future changes	3.65	1.016	7	High
7	The principal has coordinated plans to upgrade teachers to keep pace with future changes	3.59	0.942	8	High
8	The principal is keen in his planning to incorporate modern technological changes into schoolwork	3.84	1.084	3	High
9	The principal has modern communication systems that keep pace with modern changes	3.45	1.137	9	High

To answer this question, the descriptive analysis was used (arithmetic means & standard deviations) to reveal the effectiveness of the performance of principals of basic schools for all aspects of change management. The descriptive analysis for each field is as follows:

First: Planning

The arithmetic means and standard deviations were obtained to reveal the effectiveness of the performance of the principals of basic schools in the change management in the field "planning" (see Table 3).

Table 3 demonstrates that the arithmetic means of the field's statements ranged between (3.45–3.87). Statement (4) reads "The principal considers changes in the field while setting the school schedule." The researcher attributes this to the principals' awareness of what is happening in the educational field and the wide awareness campaigns. While Statement (9), "The principal has modern communication systems that keep pace with modern changes" ranked last in a high degree and a mean of (3.45). The researcher attributed this to the lack of provision of electronic devices and communication systems within the school, and this may also be due to the weak infrastructure of communication systems.

Second: Follow up and implementation

The arithmetic means and standard deviations were extracted to reveal the effectiveness of school principals' performance of the basic fields of change management in the field of follow up "implementation", as indicated in Table 4.

Table 4 Descriptive analysis of the "Follow up and implementation" field

	Statements	Mean	SD	Rank	Degree
1	The principal explains the school's strategic plan to teachers	3.71	1.101	7	High
2	The principal seeks to constantly develop the skills of teachers and train them to keep pace with change	3.49	1.065	9	High
3	The principal encourages teachers to come up with creative ideas to advance the teaching process	4.14	1.000	1	High
4	The principal overlooks minor errors as they are remediable within the school	3.92	1.055	4	High
5	The principal rewards teachers with creative solutions associated with change	3.65	1.214	8	High
6	The principal encourages the use of modern technologies in the teaching process within the school	3.98	1.049	3	High
7	The principal monitors change processes within the school to provide feedback to teachers	3.76	1.176	6	High
8	The principal strives to provide the best buildings and technical equipment for the school to keep pace with the changing processes	4.02	1.068	2	High
9	The manager activates the means of communication in all its branches to clarify the change process	3.84	1.046	5	High

Table 4 shows that the means of this field ranged between (3.49–4.14). Statement (3) which stated, "The principal encourages teachers to come up with creative ideas to advance the teaching process." came in the first place with a high degree (4.14). The researcher attributes this result to the good awareness that has taken place in the educational field and a large number of training programs in the same field, while Statement (2) "The principal seeks to constantly develop the skills of teachers and train them to keep pace with change." ranked last and to a high degree, with a mean (3.49). The researcher attribute this to what the educational system was exposed to in schools during the Corona pandemic.

Third: Evaluation

Descriptive analysis was extracted to reveal the effectiveness of basic school principals' performance of change management in the field of evaluation, as seen in Table 5.

Table 5 indicates that the arithmetic means of this field range between (3.33–3.75). Statement (5) which reads "The principal is keen to highlight the strengths and weaknesses of each teacher" came in the first rank with a high degree and a mean of (3.75). The researcher attributes this to the career culture followed by the principals, while statement (4) "The principal focuses on evaluating qualitative performance and neglects quantitative performance." ranked last with a medium degree and a mean (3.33). The researcher attributes this to the behaviour of some principals and

Table 5 Descriptive analysis of the field "Evaluation"

	Statements	Means	SD	Rank	Degree
1	The principal follows real standards for evaluating the educational process	3.69	0.927	3	High
2	The principal depends on unconventional standards compatible with technical development	3.71	0.879	2	High
3	The principal uses a modern system for the process of motivation and creativity within the school	3.59	0.983	5	High
4	The principal focuses on evaluating qualitative performance and neglects quantitative performance	3.33	0.993	7	Medium
5	The principal is keen to highlight the strengths and weaknesses of each teacher	3.75	0.935	1	High
6	The principal displays the results of the teacher's evaluation after each evaluation process	3.67	0.931	4	High
7	The principal has an accounting system by which the negligent in his work is held accountable	3.45	0.966	6	High

their lack of full knowledge of quantitative performance and its importance in the educational process.

3.2 Results of the Second Question

What is the order of the areas of management change according to the performance of principals of basic schools in light of the Corona pandemic, from the teachers' perspective? Descriptive analysis was conducted to answer this question.

Table 6 indicates that the total arithmetic mean of the effectiveness of school principals' performance of change management was (3.73) and it came to a high degree. The follow-up and implementation field ranked in the first place with a high degree and a mean of (3.83), followed by the Planning field, which obtained a high degree and a mean of (3.73). Where the field Evaluation came last with a high degree and a mean (3.60).

Table 6 Descriptive analysis for the effectiveness of the performance of principals of basic schools for managing change, according to the order of the fields

	Field	Mean	SD	Rank	Degree
1	Planning	3.73	0.843	2	High
2	Follow up and implementation	3.83	0.907	1	High
3	Evaluation	3.60	0.740	3	High
Total			3.73	0.803	High

3.3 Results of the Third Question

Are there statistically significant differences at the significance level (0.005) in the effectiveness of the performance of principals of basic schools in the Sultanate of Oman in the areas of management change during the Corona pandemic due to the variable (gender, qualification)? To answer this question, the arithmetic means and standard deviations of the effectiveness of the performance of principals of basic education schools for managing change were calculated according to the variable (type). the "t" value was calculated for the arithmetic means as shown in Table 7.

Table 7 shows that there are no statistically significant differences at the significance level ($0.05\alpha \leq$) to the degree to which school principals practice change management attributable to the governorate's variable in the three fields and the overall tool.

Gender and Qualification variables

The arithmetic means and standard deviations were calculated to reveal the degree of school principals' practice of managing change by gender variable, and the "t" value was calculated for the arithmetic means as shown in Table 7.

Table 8 shows statistically significant differences at the significance level ($0.05\alpha \leq$) in all fields and the overall tool favour of females. The researcher attributes this

Table 7 Descriptive analysis, and "t" value for the degree of school principals' practice of change management according to the governorate's variable (the middle and eastern)

Field	Gender	N	Mean	SD	T-value	Sig
Planning	Male	190	3.77	0.907	0.290	0.786
	Female	210	3.70	0.997		
Follow-up and implementation	Male	190	3.88	0.980	0.288	0.766
	Female	210	3.80	0.840		
Evaluation	Male	190	3.59	0.920	0.145	0.881
	Female	210	3.55	0.540		
Total	Male	190	3.76	0.907	0.267	0.785
	Female	210	3.69	0.712		

Table 8 Descriptive analysis and the value of "t" for the effectiveness of the performance of principals of basic education schools for managing change by gender variable

Field	Gender	N	Mean	SD	T value	Sig
Planning	Male	90	3.12	1.074	3.774	0.001
	Female	110	3.99	0.570		
Follow up and implementation	Male	90	3.15	1.155	3.972	0.001
	Female	110	4.12	0.595		
Evaluation	Male	90	3.11	0.974	3.283	0.002
	Female	110	3.80	0.513		
Total	Male	90	3.13	1.041	3.930	0.001
	Female	110	3.98	0.516		

result to the excessive care in the teaching and learning process, and the clear interest of female teachers in the education processes.

Table 9 indicates that there are differences between the effectiveness of the performance of basic school principals for change management fields in the Sultanate of Oman, attributed to the academic qualification variable, and to determine if there are statistically significant differences between the means of the fields at the level of significance (0.05 The ANOVA analysis was conducted as indicated in Table 9.

Table 10 shows that there are no statistically significant differences at the level (0.05) between the degrees of effectiveness of the performance of principals of basic schools for the fields of change management attributable to the academic qualification variable. The "f" value reached (0.657) with a level of significance (0.602). As shown the value of the significance is greater than (0.05), which indicates that there are no statistically significant differences for the academic qualification variable.

Table 9 Descriptive analysis and the "t" value for the effectiveness of the performance of principals of basic school by qualification variable

Variables	Mean	SD
Bachelor's	3.67	0.89
Bachelor's + Higher Diploma	3.56	0.95
Master's degree and above	3.45	0.93
Total	3.52	0.91

Table 10 ANOVA analysis results

Source of variance	SS	DF	MS	F value	Sig
Between groups	0.872	2	0.499	0.657	0.602
Within groups	125.54	209	0.678		
Total	126.412	211			

4 Conclusion

The study concluded that the order of the study fields regarding the effectiveness of the performance of the principals of basic school for change management according to the means of the responses was as follows: Follow-up and implementation (3.83), planning (3.73), and evaluation (3.60). The three fields obtained a high degree. It was found that all the statements of the change management came to a high degree except the statement which reads "The principal focuses on evaluating qualitative performance and neglects quantitative performance" under the field "Evaluation," which came to a medium degree. The researcher attributed this to the fact that principals an evaluation method in only one aspect, which is under the administrative regulations and laws and the ones stated in job descriptions. The study proved that there are statistically significant differences at the significance level (0.05) in all areas and the overall scale in favour of females and that there are statistically significant differences between the means attributed to the academic qualification variable.

5 Recommendations

1. Urging the Ministry of Education to adopt the process of change as a future project for all school leaders.
2. Develop an executable plan for selecting school leaders with appropriate specifications and conditions so that they are able to practice the process of change.
3. Continuing to implement qualitative programs for all employees of the Ministry of Education, especially teachers, to accept the change process smoothly.
4. Involve all school principals working in the Ministry of Education in special qualitative programs to measure the extent of the competencies they possess during the change process.

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The Effectiveness of Mobile Phones Applications in Learning English Vocabularies

Ibrahim Fathi Huwari, Saddam Rateb Darawsheh, Anwar Saud Al-Shaar, and Hevron Alshurideh

Abstract There is an increasing trend of moving away from traditional technology in the learning process and toward mobile technologies. Today students are well-equipped with this technology, which may facilitate this transition. The purpose of this study is to determine how frequently Jordanian students use their smartphones to learn vocabulary, as well as which application is the most and least preferred for learning vocabulary, and whether they believe that utilizing smartphones will help them enhance their vocabulary. The quantitative research approach was used in this research. The researchers adopted the questionnaire to collect the research data. (135) fourth-year students from Zarqa University (ZU), who studies English language and Translation studies, participated in this research. The findings showed that the majority of Jordanian bachelor students at ZU use their Smartphones for learning vocabulary. IOS and Android were the most used applications among students at ZU. While the least preferred applications were Skype, Viber, Imo, and Hi. The majority of the students believe that using Smartphone help them to improve their vocabularies while searching for the meaning, spelling, pronunciation of the words, listening to English videos through YouTube, English channels, and English music, and using social media. Based on the findings, the researchers provide a number

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_25

of recommendations and more studies that may aid academics in understanding the innovations needs in the area.

Keywords Mobile phones · Learning vocabularies · Jordanian students

1 Introduction

Technology has been a particularly important source of information in modern civilization during the last fifty years, offering up a range of new options in a variety of activities (Almaagbh and Huwari, 2021). Technology is changing the way people interact, play, shop, study, do business, and communicate (Ababneh, 2017). In the past, explaining information and giving lectures were the method that teachers used in teaching, but nowadays, students try to use other ways such as mobile phones in learning (Hameed, 2019). According to studies, pupils who utilise mobile devices are more motivated to learn (Tayan, 2017; Zheng et al., 2017). For example, Tayan (2017) reported that 85% of university students and 100 percent of professors said mobile learning may be used to motivate students to study a foreign language. This is also connected to the fact that students generally prefer the use of mobile devices in foreign language lessons (Kwangsawad, 2019). Traditional techniques of language learning, such as traditional classroom instruction, are put under duress as a result of these developments. They also provide us excellent opportunities to rethink how we teach and learn English (Murray and Kidd, 2017). Mobile phones have become an almost necessary part of daily life since the 1990s. Mobile technology's mainstreaming has resulted in mobile devices that are increasingly functioning as superb learning platform (Al-Sofi, 2021; Muhammad Alshurideh et al., 2012, 2019). According to a national study conducted in 2010, mobile phones are the most significant mode of communication for young people (Alshurideh, 2012, 2016; Alshurideh et al., 2020a, 2020b; Al-Sofi, 2021). Mobile devices, on the other hand, allow students to interact with one another in both informal and formal English learning settings. Also, using technology in teaching for the purpose to understanding is a positive step and it is agreed by most of the schools, colleges, and universities all around the world (Alshurideh, 2012; Alshurideh et al., 2021). Technology can play dynamic role in improving education system (Alshurideh et al., 2020a, 2020b; Reiser and Dempsey, 2012). Through our history, the global amounts of books were our controlling source of knowledge. There is no doubt that technology has advanced highly in the last half-century. Technology has provided unusual improvements to our world, being an eternal source of entertainment and continuously communication anywhere at any time (Douglas, 2001). For that reason, using mobile devices in teaching becomes more popular (Seraj et al., 2021). Nowadays, students have shifted using traditional technologies towards mobile/smart phones (Akour et al., 2021; Alhamad et al., 2021; Hongmei, 2021).

The bulk of mobile applications, according to Heil et al. (2016) research, are focused on vocabulary acquisition. They observed that 84 percent of the top commercial language learning applications focused on practising vocabulary items as isolated units, whereas 53 percent assessed vocabulary in context, which is critical for building students' vocabulary knowledge through inadvertent repeated exposure to new terms. It is critical for pupils to study vocabulary to improve their understanding of a second language. One of the most crucial parts of language acquisition is vocabulary. It is important in the development of language. Furthermore, vocabulary is one of the most important aspects of language acquisition. It is essential in the development of language (Al-Sofi, 2021). Furthermore, many English as a Foreign Language (EFL) students may not be able to practise the language with native speakers. As a result, smartphone applications are expected to bridge this gap by introducing new vocabulary to users and to play a significant role in facilitating communication in virtual circumstances. Furthermore, despite the widespread use of smartphone apps and their importance in vocabulary acquisition, the use of these pre-existing apps for learning purposes is still being researched (Al-Hamad et al., 2021; Leo et al., 2021; Rahimi and Miri, 2014). In addition, using mobile phones in learning is more effective than using tradition technologies such as laptop or personal computer (Asyifa et al., 2019; Al Kurdi et al., 2020a, 2020b; Amarneh et al., 2021). This statement was supported by a research done by (Lu, 2008) on Taiwanese students. The result was students are preferred to use mobile phones rather than other traditional technologies because mobile phones are easily to use and find always with them. The advantages of using a mobile phone in learning a second language include**:**

1. A more rewarding and engaging learning experience. The usage of mobile devices improves traditional learning by making it more dynamic, exciting, and entertaining, making the learning experience more engaging and rewarding overall (Al Kurdi et al., 2020; Ciampa, 2014).
2. The capacity to learn in a flexible, cost-effective, and timely manner.
3. It provides a one-of-a-kind blend of convenience and social engagement, allowing for face-to-face connection with other students as well as instructors/educators (Attewell and Savill-Smith, 2003; Bettayeb et al., 2020).
4. Improved interaction between students and instructors. Amazingly, communication between learners and instructors is considerably superior to that observed in conventional learning situations when technology is not used in classrooms (Attewell and Savill-Smith, 2003; Sultan et al., 2021).
5. Kids prefer to use mobile phones because it's advantages such as applications, and games (El Hariry, 2015; Nazir et al., 2021).
6. Improving students' ability to analyze, explore, discover, and choose activities that are real and meaningful (El Hariry, 2015; Al-Maroof et al., 2021).
7. Using a fun way in learning by using mobile phones (Alsharari and Alshurideh, 2020; El Hariry, 2015).

Many technological breakthroughs are now permeating our daily lives. The smartphone is one of the most contemporary technological devices. The smartphone, which is becoming increasingly popular, has become an essential component of many

people's life, particularly among the younger age. In addition to mobile communication, smartphones offer a number of services such as Viber, WhatsApp, Instagram, tango, and so on. These qualities boost smartphone popularity and make them appealing and desired to a diverse group of people (Güdücü, 2016). The use of mobile/smart phones in learning is critical for both students and teachers. As a consequence, smartphones may assist in English language development and provide our students with a rich learning environment (Hsu and Ching, 2012). They advocate for mobile-based learning, which allows students to benefit anytime and wherever they wish (Sandberg et al., 2011). Mobile phones, according to Hsu and Ching (2012) can assist pupils improve their vocabulary.

Several studies explored the importance of mobile phones in learning and teaching. The most recent studies were done by Ta'amneh (2021). He investigated the difficulties of using smart phones among Saudi students at Taibah University (Badr Branch) studied English language through students' perspectives. The sample of this study is 151 students for the academic year 2019/2020. The researcher used a questionnaire adopted from other studies to achieve his goals. The results of his study were students showed positive with moderate usage of their Smartphone in their attempt to learn English. At the same time, there were no difficulties faced by students in learning through smartphones. In Jordanian context, a study done by Ababneh (2017), the purpose of this study is to find out how Jordanian EFL students feel about using their phones to learn English as a foreign language. The study's goal is to learn more about Jordanian EFL students' knowledge of the need of using technology (mobile phones) correctly in English learning. Furthermore, it intends to investigate the impact of their gender and academic major (English—Translation) on their attitudes regarding utilizing mobile phones to learn English as a second language. The study included 101 students enrolled in English (417), a semantics course offered by the English Department at Yarmouk University in Jordan. The subjects' attitudes toward and use of mobile phones were investigated using a questionnaire. The results showed that the subjects' average score for using their phones while learning English was 3.85 out of 4, indicating that mobile phones are widely used in English learning. The students are also enthusiastic about using their mobile phones to improve their English skills. The results also reveal that both the gender of the individuals and their academic major had a significant impact on their use. Another study was done by Al Aroud and Yunus (2020) examined English as foreign language students at Yarmouk University engagement in utilizing e-learning apparatuses in learning the English. The researchers used a mixed-method approach included 1st first-year English Language and Literature students who were chosen randomly. The findings of the study showed that past experiences affected EFL Jordanian undergraduate students at Yarmouk University's usage of e-learning technologies / MOOCs when studying English.

An Indonesian study done by Asyifa et al. (2019), they looked into the characteristics of mobile phones that EFL students could utilize, as well as their perceptions of such aspects. This study, which took place at one private institution in Jakarta aimed to address two primary questions: (1) what are the characteristics of mobile phones that EFL students most commonly utilize to aid their English learning? (2)

What are EFL students' attitudes about the usage of mobile phone features in the context of English learning? The researchers used a questionnaire in this study. The results showed that students use mobile phone features for learning English, with MP3 players being the most commonly used function for listening to English music, while the least was video recorder. Meanwhile, the students clearly said that they loved learning English with the use of mobile phone characteristics. They improved mobile phone capabilities to aid self-learning rather than conventional learning.

2 Vocabulary Learning

Vocabulary development is critical for foreign or second language learners to achieve proficient communication skills (Al-Khasawneh, 1998; Al-Khasawneh and Huwari, 2014; Huwari et al., 2021) As the attention in vocabulary acquisition expands, many types of tools are now available to learners and students, and one of those is mobile applications, which is one the most efficient, and famous. Furthermore, there are two types of vocabulary learning: intentional and accidental. Any action aimed at committing lexical information to memory is defined as intentional vocabulary acquisition. It involves investing the necessary mental effort and memorizing the words until learners know their meanings (Basal et al., 2016). It is claimed that adopting mobile technology to study English as a second language will improve teaching and learning (Basal et al., 2016). The device's mobility allows students to learn whenever and wherever they choose. Mobile devices, which are frequently utilised among students, may be employed in education and can serve as a motivating tool for pupils (Govindasamy et al., 2019). Learners who acquire language on their phones are subjected to spaced repetition, which is thought to be more addictive than massed repetition. This kind of learning is advantageous to vocabulary development because it allows learners to learn further than linguistic form (Zhang et al., 2011). Hwang and Fu (2019) analysed 93 publications and found that the majority of research agreed that the use of mobile applications for increasing language abilities, particularly vocabulary learning, had potential efficacy. Similarly, Al-Sofi (2021) performed a study to evaluate Saudi learners' perceptions of the applicability and usefulness of smartphone apps (apps) in enhancing vocabulary learning. An online questionnaire and the researcher's observation were utilised to collect data from 270 English majors at the University of Bisha in Saudi Arabia. The SPSS and NVivo software programmes were used to analyse the data. Overall, respondents believe that smartphone applications are effective in improving vocabulary learning because they play a transforming role in providing users with suitable vocabulary input. Fageeh (2013) carried out research among undergraduate Saudi EFL learners to investigate the effects of mobile phone applications in terms of boosting vocabulary learning and motivation. These applications improved vocabulary acquisition, according to the findings.

A study done by Rezaei et al. (2014) investigated the usage and efficacy of mobile applications in the learning of English vocabulary. This study compares the performance of intermediate-level English learners before and after they were exposed to mobile applications as an intervention. It looks at the effects of multimedia courseware on vocabulary development in second language learning. The quantitative results showed that the apps improved learners' performance, and the questionnaire analysis revealed that utilising the applications improved vocabulary learning, confidence, and class involvement, and that students had a good attitude about multimedia use.

The impacts of YouTube videos on student vocabulary development were investigated by Kabooha and Elyas (2018). According to the findings, students thought these tools were effective for learning vocabulary and that the website was simple to use. In another study, Zhang et al. (2011) studied the effectiveness of vocabulary acquisition using mobile phones. From two entire classes of sophomores at a Chinese university, two groups of students (N = 78) were formed: the SMS group (the experimental group) and the paper group (the control group). Following that, they were given a pre-test to determine their prior vocabulary knowledge level. According to the statistics, there was no significant difference ($p > 0.05$) between the SMS group (Mean = 33.34, SD = 14.30) and the paper group (Mean = 37.13, SD = 15.21). They were then assigned to one of two intervention scenarios. The SMS group studied a pre-selected list of vocabulary using text messages delivered to their mobile phones, whereas the paper group worked independently on the same list of vocabulary using paper materials. In the post-tests, there was a significant difference (p.05) between the two groups, but not in the delayed tests ($p > 0.05$). The study concludes that each of these vocabulary acquisition approaches is good, but that combining them may be more beneficial in terms of long-term retention rates. These findings were reinforced by Bloom and Shuell (1981) empirical research of two groups of students (N = 56) learning French vocabulary items. The pupils were divided into two groups: those who got scattered (spaced) practise and those who received massed practise. The post-test findings showed no significant difference between the two groups, but a four-day delayed test indicated that the group with spaced practise fared much better than the group with massed practise. The experimental group had the chance to "practise [both] the vocabulary terms themselves… [and] their recall from long-term memory", but the control group could only "recall information from short-term memory during learning" (Hwang and Fu, 2019, p.247).

A difficulty that has hindered good communication in an L2 is a limited vocabulary. Learners, like smartphone users, may come across unfamiliar language while carrying out the planned operations. Students were unable to adequately communicate their ideas and opinions using an L2 due to a lack of vocabulary. They resorted to utilising their L1 (Arabic) as the type of code-mixing approach to express the intended message and relied on nonverbal communication abilities. Such requirements may serve as an internal motivator for students to use smartphone applications favourably for L2 vocabulary development. To put it another way, pupils are no longer limited to traditional vocabulary memorising. The current study sought to answer the following questions:

1. How often do Jordanian students use their smartphones for learning vocabulary?
2. From your point of view, what is the most and the least preferable application in learning vocabulary?
3. Applications for IOS, and Android, Online dictionaries, WhatsApp, others.
4. Do you think that using smartphones help learners to improve their vocabulary? If yes, how?

3 Research Methodology

3.1 Research Design

This study employed a quantitative research strategy, with data gathered via questionnaires. The more the researcher focus on guaranteeing the principles of a sound research design, the greater the researcher's and, more importantly, the study's user's trust in the research's recommendations and eventual usefulness (Creswell, 2012). This emphasis on data quality may be applied to any study. And, while it is most commonly discussed by survey researchers, quantitative researchers are increasingly discussing data quality issues as well.

3.2 Participants of the Research

Thirty-four individuals participated in this study. The whole participants were undergraduate fourth-year students at Zarqa University in Jordan. However, the major of the participants included both majors' English literature and Translation. The average is between 19 to 22 years old. In condition, each participant in the study owned a mobile phone.

3.3 Data Collection

In this research paper, the researchers employed a questionnaire to gather data. Ababneh (2017) used a five-point Likert Scale to develop the questionnaire (Strongly Agree, Agree, Neutral, Disagree and Strongly Disagree). Students were asked to rate how much they agreed with each of the sixteen items on the questionnaire. The participants were invited to express their true feelings. Furthermore, the researchers answered all questionnaire-related queries from participants to ensure that their responses were correct.

3.4 Data Analysis

The researchers utilised a manual analysis technique in this investigation since they uncovered a tiny number of databases, which were represented in less than 500 pages of transcripts. This merely aids in the location of text sections and the organisation of files. Furthermore, the researcher intended to avoid machine intrusion and have a hands-on sense of data. To become acquainted with the material obtained, the researchers transcribed all of the interviews. According to Lincoln and Guba (1985), the transcribing process aids the researchers in becoming acquainted with the data. The following steps were taken by the researchers of this study when it came to the verbatim transcription of the interview. First, the researchers listened intently to the audio recording of the interview guide questions. Second, on a blank sheet of paper, they typed down the exact words used by the participants when they were obliged to express their ideas. When required, the researchers replay the recordings to find the exact data. Finally, the recordings are replayed to check that the results are correct.

4 Findings/Results

The objectives of the paper were investigating about the frequency of Jordanian students using their smart phones for learning vocabulary, and then what is the most and the least preferable application in learning vocabulary and lastly whether you think using smart phones will help learners to improve their vocabularies.

Q1: Do Jordanian EFL learners use smartphones for learning English?

As is illustrated in Fig. 1, the majority of Jordanian bachelor students at ZU use their Smartphones for learning English. 32 students out of 34 students (94.1%) use their Smartphones for learning English. On the other hand, only 2 students (5.9%) showed that they do not use their Smartphones for learning English.

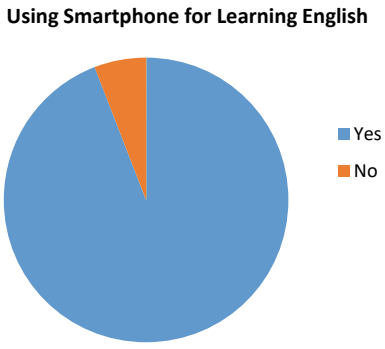

Fig. 1 The percentage of learners using Smartphones for learning vocabulary

Q2: How often do you use your Smartphone for learning vocabulary?

As it is illustrated in the Fig. 2, half of the participants (50%) of Jordanian bachelor students at ZU (17 students out of 34) declare that they sometimes use their Smartphone's for learning vocabularies. Besides, 14 out of 34 students (41.2%) declare that they usually use their Smartphones for learning vocabulary. While the rest of the students 2 out of 34 students declare that they are rarely used their Smartphone's for learning vocabularies. The last colon, only 1 student (2.9%) showed that he is very often used his Smartphone's to learn vocabulary.

Q3: From your point of view, what are the most and the least preferable application in learning vocabulary? Applications for IOS, and Android, Online dictionaries, WhatApp, others.

As illustrated in Fig. 3 about the most and the least preferable application in learning vocabulary, students did not show a huge gap between the applications that they use in learning vocabularies. Applications for IOS and Android was mentioned by 11 students out of 34, using online dictionaries was used by 10 students out of 34, WhatsApp was also preferred to be used by 8 students out of 34, while the least preferred application was others such as Skype, Viber, Imo, Hi, were mentioned by 5 students only.

Q4: Do you think using Smartphones help you to improve your vocabulary? If yes, how?

In regarding to the fourth question, almost all students (32 out of 34) believe that using Smartphone's help them to improve their vocabularies. The way that students use their Smartphone's helps them to improve their vocabularies such as searching for the meaning, spelling, pronunciation of the words, listening to English videos through YouTube, English channels, and English music, and using social media.

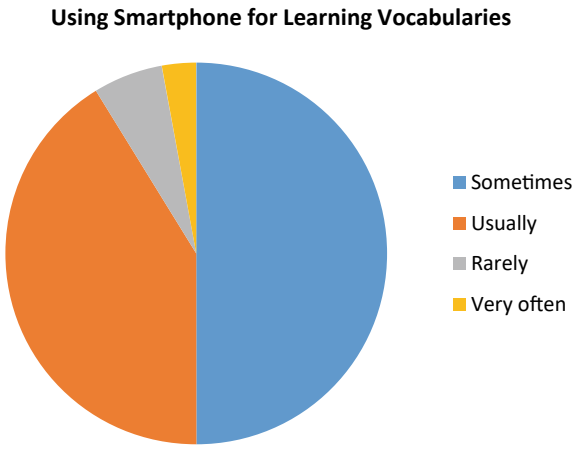

Fig. 2 The percentage of learners using Smartphone's for learning vocabularies

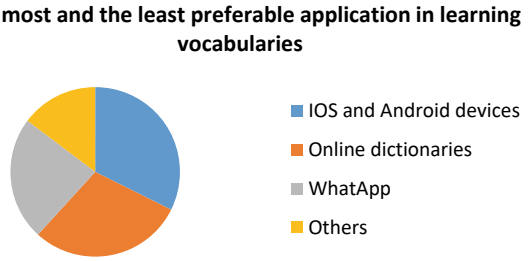

Fig. 3 The most and the least preferable application in learning vocabulary?

The first theme was searching for the meaning, spelling, and pronunciation of the new words. At this point, the majority of the students showed that looking for a new word using Smartphone is much easier than the traditional way. One of the students said that: *Since I have started using my phone to gain more vocabulary, the number of vocabulary that I have is already increased, I think. As I can get the pronunciation as well.*

Spelling is also important in Smartphone. One student said: *I am sure my phone helps me to improve my spelling, as I was writing the new word on a piece of paper so that I avoid spelling mistakes once I come to English composition.*

The second theme was listening to English videos through YouTube, English channels, and English music which help students to improve their vocabulary. In this theme, the majority of the students showed that listening to English audios was a way to improve their vocabulary. One student said: *The best way for me to increase the number of vocabulary was listening. I keep watching English movies then I write down the new vocabularies that I gain on each video or film.*

The third theme was using social media platforms which helps students to improve their vocabulary. This theme was mentioned by half of the whole population in this study. Social media like Facebook or Twitter was a way to improve students' ability to gain new vocabulary. One student said that: *Facebook is one of the ways that help me to improve my vocabulary. I follow some pages which focused on English vocabularies by providing new vocabularies. Then I write down them and try to use them in my speech.*

5 Discussion

One of the most crucial parts of language instruction is vocabulary development. Idioms, which are an important component of vocabulary knowledge, and idiomatic knowledge, can assist learners in becoming fluent in the target language (Boers et al., 2006). Using Smartphone applications could facilitate mobile learning practices considerably (Thornton & Houser, 2005). An example of a smartphone application is using WhatsApp, which is a free mobile application that allows its users to exchange texts in either way one-to-one or groups conversation and make calls.

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In terms of the usage of smartphones for learning English, this study agrees with Güdücü (2016) about the use of smartphones in learning English among different nationalities studying for an undergraduate degree in Turkey. According to his research, 63.3% of students use their smartphones for instructional purposes. Lincoln and Guba (1985) proved that learners utilize their smartphones for language acquisition with the support of mobile web apps. According to Kim et al. (2013), ICT may be an effective instrument for providing diversity to learners and assisting them in learning English. Every learner is unique; they all have distinct learning methods (such as visual/auditory/verbal/musical). The findings of the interviews demonstrate that learners have learning differences and have good attitudes regarding the usage of smartphones since it includes visuals that help them comprehend better.

Previous research indicated that students had favorable attitudes toward the use of mobile applications for vocabulary acquisition. Hayati et al. (2013) investigated three approaches of teaching vocabulary (self-study, SMS, in class). They observed that the SMS group advanced significantly quicker than the other groups that received positive feedback on using mobile phones to learn vocabulary. Lu (2008) made a similar discovery, demonstrating that the SMS group identified more vocabulary than the printed materials. According to [15], using a mobile phone to communicate vocabulary is more effective than using other approaches such as flashcards. A study by Güdücü (2016) investigated the usage of smartphones in acquiring English vocabulary among students of various ethnicities in Turkey pursuing an undergraduate degree. It was revealed that preparatory students frequently use their cell phones to acquire language. Online dictionaries, such as Merriam-Webster, are preferred by students over paper dictionaries. One of the participants, for example, states that he consults the Merriam-Webster dictionary to determine the definition of a word. To remember the terms for the future, he prefers English to English dictionaries. According to an examination of the questionnaire data on smartphone use, 13% of learners always use their cellphones as an electronic dictionary, as shown below. 43,3% of them do so often, and 40% do so sometimes. The data reveals that smartphones were utilized by preparatory learners to boost vocabulary acquisition.

The current study's findings are consistent with those of Lu (2008) and Zhang et al. (2011), who discovered that short-term spaced vocabulary acquisition using mobile phones can be more effective than massed vocabulary learning via paper. This might be due to the students' convenient access to the mobile device, resulting in their recurrent exposure to and frequent practice of the vocabulary items daily in a spaced manner. This type of learning technique encourages enhanced vocabulary learning (Waring and Nation, 2004). The findings of the questionnaire and interviews show that using smartphones has a significant impact on learners' vocabulary development.

6 Conclusion

Results of this study indicate that majority of Jordanian bachelor students at ZU use their Smartphones for learning vocabulary. 32 students out of 34 students (94.1%) use their Smartphones for learning vocabulary. In addition, the second research question was declared that half of the participants (50%) of Jordanian bachelor students at ZU (17 students out of 34) declare that they sometimes use their Smartphones for learning vocabulary. Besides, 14 out of 34 students (41.2%) declare that they usually use their Smartphones for learning vocabulary. While the rest of the students 2 out of 34 students declare that they are rarely used their Smartphones for learning vocabulary. In the last colon, only 1 student (2.9%) showed that he is very often used his Smartphones to learn vocabulary. In the last research question, almost all students (32 out of 34) believe that using Smartphones help them to improve their vocabulary. The way that students use their Smartphones helps them to improve their vocabularies such as searching for the meaning, spelling, pronunciation of the words, listening to English videos through YouTube, English channels, and English music, and using social media platforms.

7 Recommendations

Learners' understanding of the importance of vocabulary acquisition in language learning, as well as the usefulness of smartphone applications in vocabulary development, is critical. Being acclimated to the good use of smartphone applications, in particular, prepares students sufficiently for the work market following graduation. Instructors and policymakers should motivate learners to use such self-led and self-directed apps to effectively serve their learning requirements and personal choices that complement in-class assignments and activities, while real use of smartphone applications for vocabulary acquisition may be inadequate. They should be encouraged to keep up with the latest apps and to perceive smartphone devices as more than simply social and/or entertaining tools, but also as complementary learning tools that help them enhance their fluency. While developing free educational applications, designers should also answer the communicatively authentic wants of users. Vocabulary knowledge is a difficult task that must be built gradually. Once the motivating and promising status of smartphone applications is established, it is envisaged that using them for learning purposes will become commonplace and a deliberate decision in the learning process.

8 Limitations

This study has limitations concerning the number of participants and the method used to collect data. A large-scale study is required to assess the benefits and drawbacks of vocabulary learning using cell phones. Furthermore, additional research is required to evaluate the strength of the relationship between mobile applications and their effectiveness in vocabulary learning.

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The Effect of Using SCAMPER Strategy on Developing Students' Achievement

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Abstract The study aimed to find out the effect of using SCAMPER strategy on developing students' some habits of mind.. The participants were chosen from the Fifth-grade students prep stage and they were divided into two groups, experimental and control group. The study tools prepared by the researcher (achievement test and habits of mind questionnaire) were pre- administrated. The experimental group learnt the presented material using SCAMPER strategy and the control group studied in the traditional method. The study tools were post applied. The results showed that there were statistically significant differences at the level (0.01) between the mean scores of experimental and control groups in the post application of the tools in favor of the experimental group.

Keywords SCAMPER strategy · Students' achievement

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_26

1 Introduction

The philosophy of the SCAMPER strategy is based on the idea of helping students generate new or alternative ideas. It enables the learner to access, analyze and evaluate the text as well as to think creatively and critically to find solutions. The name came from the beginning of the first letter of the word SCAMPER (Switch, add, adapt, modify, dig, put other uses, delete, reverse, rearrange) (Antonacci et al., 2014). There are a number of pillars upon which the Scamper strategy is based, namely that training in imagination in the manner of fun and play, and conducting mental treatments through the Spurring Checklist contribute to the development of creative thinking and imagination, and this is done By either providing programs and activities that aim to teach thinking independently of the regular school curricula, and as a single curriculum as an independent enrichment program for the development of creative thinking, or by indirectly providing activities and developing creative thinking and presenting the strategy within the content of the regular curriculum, and the owners of this view. The tendency is that mental operations are learned in this direction through teaching with the scamper strategy (Horn, 2013). When using the scamper strategy, it is not necessary to use the seven mentioned steps, but some of them can be chosen according to the nature of the lesson presented, and the required skill: this means that the use of the strategy will depend on what is appropriate for the topic of the lesson (Animasahun, 2014).

Gladding (2007) defines SCAMPER strategy as a technique to solve problems which can be used to stimulate individuals when facing a problem by helping them to use or recycle their present ideas to reach a solution, this solution can be used in similar situations. everything new is just a modification to what already exists (Georgiakakis et al., 2010; Alshurideh et al., 2020; Alshurideh et al., 2021). SCAMPER strategy guides the learners to find creative ideas. Several studies have showed that creativity can be developed using SCAMPER strategy like (Zomerdijk, 2010; Folashade, 2012; Moreno and Yang, 2014). In today's classrooms, it is important to engage thinking and creative activities that enable students to go beyond the simple memorization of facts. Developing these thinking dispositions help students to understand, to reason and apply information to solve problems both in and out of the classroom. Particularly in English as Second Language (ESL) classrooms, verbal interaction or communication is a major key to learning a second language. Thus, there is a need to move from the traditional focus on how many answers a student knows to a focus on engaging habits of mind as the learning outcome in a teaching and learning classroom (Costa, 1985).

2 Problem of the Study

The problem of the study is represented by the weakness of Fifth grade students in achievement in the study of artificial intelligence methods. In an attempt to solve this problem, the researchers used the Scamper strategy to find out its impact on developing the achievement of Fifth graders in the chapter of artificial intelligence.

3 Purpose of the Study

The purpose of the study was to develop Fifth grade students' achievement.

4 Questions of the Study

The present study attempted to find answer to the following main question:

What is the effect of using SCAMPER strategy on developing Fifth grade students' achievement?

5 Hypotheses of the Study

This study sought to verify the following hypotheses:

1. There will be a statistically significant difference between the mean scores of the achievement test of the experimental and control groups in the post administration of the test in favor of the experimental group.
2. There will be statistically significant differences between the mean scores of the experimental group in the pre- and post-administration of the achievement test in favor of the post test.

6 Aims of the study

The present study aimed at identifying the effect of using SCAMPER strategy on developing Fifth grade students' achievement.

6.1 Variables of the Study

1-Independent variable

Using SCAMPER strategy to develop Fifth grade students' achievement.

2-Dependent variable

- Fifth grade students' achievement.

6.2 Delimitations of the Study

The study is delimited to:

- Two Fifth grade students' classes from madaba preparatory school for boys in Al madaba district in madaba during the first term of the academic year 2021–2022.
- Chapter 6 artificial intelligence

6.3 The Tools of the Study

Treatment materials:

1. A teacher's guide to present the Chap. 6 (artificial intelligence) using SCAMPER strategy.
2. Activity papers for students to improve their achievement.

Measurement tools:
A pre-post achievement test.

7 Significance of the Study

The present study is hoped to achieve the following:

- Provide English language specialists and curricula designers with SCAMPER strategy to be taken into consideration in planning and constructing activities for English language students.
- Provide valid tools for testing achievement
- Support using modern teaching methods and strategies to develop language

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8 Definition of Terms

The following terms refer to the operational definition in the current study:

Strategy: A group of techniques and procedures followed by the teacher to carry out the learning process inside or outside the classroom (Alshurideh et al., 2019a, 2019b; Al Kurdi et al., 2020; Kurdi et al., 2020) to chapters (6) of the (artificial intelligence) for Fifth grade Fifth grade. It aims at developing achievement. SCAMPER strategy is planned to be used in sequence steps for the teacher and students to achieve the education objectives with less effort and time.

SCAMPER strategy: A group of procedures and techniques to help the learners to work their imagination and reach creative ideas using seven skills: S(substitute), C (combine), A (adapt), M (magnify), P (modify), P (put to other uses), E (eliminate) and reverse (Eberle, 2008).

9 Theoretical Background

9.1 SCAMPER Strategy Historical Background

SCAMPER is a mnemonic acronym that provides a planned way to help students and teachers with understanding creative problem solving and improving extension-building activities based on prior ideas and processes (Toraman and Altun, 2013). As stated by Fahmy et al. (2017), SCAMPER strategy was first proposed by Alex Osborne in 1953 who designed a spurring checklist, the first letters in the words of the checklist formed the word SCAMPER. This thinking strategy was further developed by Frank Williams who suggested some techniques to provoke imagination and creative expression for children. His techniques relied on two dimensions:

Cognitive processes such as: fluency, flexibility, originality, and tendency to having details.

Affective processes such as: curiosity, readiness to take risks, preferring complexity and gut instinct.

Finally, Bob Eberle mixed the previous experiences especially those related to generating idea and defined operationally each of the strategies forming the word SCAMPER. In his 1971 book, SCAMPER: Games for Imagination Development. Eberle states that in the same way as the word SCAMPER suggests "running playfully about as a child", the strategy SCAMPER may also require the need "to run playfully about in one's mind in search of ideas" (Oakshott et al., 2011). He formed different games and activities and pended it together to construct SCAMPER strategy to develop creative imagination. Eberle added three principles to the strategy: Magnify, minify, and re-arrange, it has become ten creative principles in the strategy instead of seven principles.

The importance of teaching using SCAMPER is due to the following (Vidal, 2005).

- Develop imagination, especially the creative imagination of students,

Providing students and teaching them to practice the methods of generating ideas included in the Scamper strategy.

Developing students' thinking skills in general and productive thinking in particular.

Enable students to generate creative ideas about the issues presented to them.

Enhancing self-concept and creating high levels of ambition among students.

Arousing curiosity, risk tolerance, and a preference for complexity among students.

Building group spirit and increasing students' attention spans.

Opening the horizons of divergent thinking among students.

Helping students to generalize the experiences gained in different life situations, after presenting them to them in a variety of contexts.

This strategy consists of the following steps and questions as mentioned by (Toraman and Altun, 2013):

First letter: S: Substitute.

The second letter: (to combine or combine): C: Combine, which is to combine or combine things.

Third letter: (adaptive): A: Adapt.

Fourth letter: (modification and development): M: Madifty.

Fifth character: (other uses): P: Put to other uses.

Sixth character: (eliminate): E: Eliminate.

Seventh letter: (rearrange or reverse): R: Reverse-Rearrange.

9.2 The Steps of Applying SCAMPER Strategy

Reviewing previous studies and literature about SCAMPER strategy led the researcher to identify two directions to apply it. The following steps are mentioned by Feather (2008) as:

- The instructor explains to the students SCAMPER strategy to encourage them to generate new and creative ideas. He also explains the guiding questions used in every strategy.
- The instructor gives the learners the text to read and understand carefully and then to generate new ideas.
- The learners choose any of the SCAMPER strategy and the instructor encourages them to write all the creative ideas they reach. Another strategy is chosen and the same steps are repeated.
- The teacher revises the list of new ideas created by the learners to identify the learners' response to the strategy.

The researcher benefited from this part in designing the chapters of artificial intelligence according the steps of the second direction of applying SCAMPER strategy and also in preparing the teacher's guide.

9.3 The Learner's Role in SCAMPER Strategy

The role of the learner in SCAMPER strategy is not a traditional one, he does not only listen to the teacher or answer questions in the classroom. The learner becomes a knowledge seeker who substitutes, combines, adapts, modifies, puts to other uses, eliminates and rearranges the information to generate creative and new ideas. The role of the learner can be summed in:

- He searches for the information and may be a source for it.
- He participates effectively in presenting ideas.
- He transfers his experience to similar situations.
- He chooses the suitable SCAMPER strategy to solve the problem in a creative way.
- He discusses the new ideas with the teacher and learns to pose questions to his teacher.
- He learns to accept the others' points of view and solutions.
- He creates the largest number of creative solutions he can reach.

9.4 The Teacher' Role in SCAMPER Strategy

The role of the learner will not be achieved without having a teacher who works as a facilitator and guide for the learning process. The teacher' role can be identified in the following points:

- He identifies the objectives that learners should achieve.
- He presents the problem or situation which provokes the learners' brains to search.
- He guides the students by explaining SCAMPER strategy and the guiding questions related to it.
- He presents suitable atmosphere in the class for discussion and cooperative work.
- He responds and answers the questions that students ask.
- He organizes the time to achieve the lesson objectives.
- He supplies feedback for the learners at every stage of the lesson.
- He evaluates the answers and solutions presented by the learners according to criteria known for the learners.
- He gives confidence to the learners and encourages them to present creative ideas.

10 Method

The design of the current study is the two groups' pre-post testing experimental design. To answer the study questions, the following procedures were followed:

1-Identifying the organization and reconstructing the content of Fifth grade (Chap. 6 artificial intelligence) **using SCAMPER strategy**

**Choosing the content*

The researcher has chosen the Chap. 6 (the course of the first term) (artificial intelligence) to be presented using SCAMPER strategy for the following reasons:

- There are also a lot of description and adventure that encounters the characters of the story.
- The Chap. 6 are to be presented through the whole second term which would give enough time to improve achievement

**Reconstructing the content*

The content was reconstructed using SCAMPER strategy as follows:

Preparing the students' activity papers

In the light of the goals and the content of the story, the researcher prepared the students' activity papers according to SCAMPER strategy. It included the content of the chapters divided into parts and followed by different activities. Different activities are presented followed by guiding questions to help the learners choose and apply different SCAMPER strategy skills. Every activity is followed by the steps that should be followed by the learners. Spaces for writing down the notes, explanations or new ideas are supplied.

Preparing the teacher's guide

The researcher has prepared the teacher's guide to teach the Chap. 6 of (artificial intelligence) using SCAMPER strategy. The guide includes introduction about SCAMPER strategy, its philosophy, skills and the steps to use it. It also gives general directions for the teacher to present the lessons and activities with the required teaching aids. Distribution of the lessons and time plan are included.

Time plan for presenting the content

The presentation of the content lasted for 10 weeks (two months and half). The teacher met the learners once every week for 90 min (one school period). The first two periods were devoted to explaining SCAMPER strategy, its skills, guiding questions and importance for the learners. The learners also were told how the content will be presented and their expected role.

2- Constructing the tools of the study

The following steps were followed to design and construct the two measurement tools of the study. The jury who kindly validate them were three staff members from the Department of Curricula and Methods of Teaching, Girls' College, Ain Shams University and two staff members from other faculties.

a. **A pre-post achievement test**

The test was designed as follows:

The test aim: It aimed at pre-post measuring achievement in the Chap. 6 –the first term (artificial intelligence) of the members of both the experimental and control groups of the current study.

Constructing the test: the test consisted of 30 questions, the first ten questions were "wh" questions which required complete answers from the students. The second ten questions were completion questions and the last ten questions were multiple choice questions.

The test validity: the first version of the test was submitted to jury members to evaluate the test in terms of (a) number of questions and appropriateness to the content and (b) suitability of the test to the Fifth grade. The jury members made some modifications which were taken seriously into consideration and were done accordingly. After the modifications were made, the test was mostly a valid one, as it showed that it measured what it was intended to measure as stated by the jury.

Reliability of the test: The test–retest method was used to determine the reliability of the test. The test was administered to 35 Fifth grade in madaba school and was re administered by an interval of fifteen days to the same group. Then, the Pearson Correlation Coefficient between the test/re-test was calculated. The reliability coefficient was 0.85 which is relatively high. So, the test was reliable.

Timing the test: During the piloting administration of the test on the same 35 students, the researcher could decide the timing of the test. The following formula was used: the time taken by all the students divided by the number of the students, (summation of the time taken by all the students)/(the number of the students) = 2100/35 = 60 min.

Scoring the test: The total mark of the test was 40 marks divided as follows: 2 marks for the complete answer of each of the ten "wh" questions (20 marks). One mark was given for the correct completion for the ten completion items (10 marks) and one mark for the correct choice in the following ten MCQ (10 marks).

Participants

The participants in the current study were two groups: experimental group and control group. Each group had 28 Fifth grade students during the first term of the academic year 2021/2022. Two classes were chosen randomly from Madaba school for boys, students of the first class were chosen as experimental group while students of the other class were the members of the control group after being sure that they had the same achievement level from their teachers.

Table 1 T-test results of the post administration of the achievement test on the experimental and control groups

Group	N	M	S.D	Difference between means	Degree of freedom	t- value	Significance level
Experimental	28	35.46	3.45	14.61	56	23.80	0.01 Significance
Control	28	20.85	2.88				

11 Data Analysis

The statistical analysis of data and the results are interpreted in terms of the research hypotheses. For this purpose, each hypothesis is presented together with the findings related to it.

11.1 The First Hypothesis

There will be a statistically significant difference between the mean scores of the achievement test of the experimental and control groups in the post administration of the test in favor of the experimental group. A t-test was thus applied to the data; (see Table 1).

Table 1 shows that the mean score of the experimental group in the post administration of the achievement test (35.46) is more than the mean scores of the control group (20.85). The difference is (14.61) marks in favor of the experimental group. The above table shows that the estimated t-value (23.80) is statistically significance at 0.01 level. The effect size was large (60.40). This shows that the members of the experimental group's achievement developed due to the positive impact of using SCAMPER strategy.

11.2 The Second Hypothesis

There will be statistically significant differences between the mean scores of the experimental group in the pre and post administration of the achievement test in favor of the post test.

Table 2 shows that the mean score of the experimental group in the post administration of the achievement test (35.46) is more than the mean scores of the pre administration (18.65). The difference is (16.81) marks in favor of the post administration. The above table shows that the estimated t-value (19.29) is statistically significance at 0.01 level. The effect size was large (7.34). This shows that the members of the experimental group's achievement developed due to the positive impact of using

Table 2 T-test results of the pre-post administration of the achievement test on the experimental

Application	N	M	S.D	Difference between means	Degree of freedom	t- value	Significance level
Post-test	28	35.46	3.45	16.81	29	19.29	0.01 Significance
Pre-test	28	18.65	5.83				

SCAMPER strategy. Thus, the second hypothesis of the study was verified and the second sub question of the study was answered.

12 Discussion of the Results

The results of the achievement test

The results showed that the use of the scamper strategy makes the learner more active than the traditional method and makes him more willing to express new ideas and thus increases his willingness and motivation to learn because he is more enjoying it. In addition, the use of different forms of learning motivates the learner to learn.

13 Recommendations

In light of the results of the study, it is necessary to continue using the scamper strategy after the teacher has been qualified and a guide to use this strategy has been prepared. And start applying this strategy at an early stage of the study. In addition to the need to measure the use of this strategy and know its impact on all English language skills.

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The Influence of Metacognitive Strategies Training on the Writing Performance in United Arab Emirate

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Abstract Writing is one of the most difficult components of learning a foreign language. Writing is the most difficult and time-consuming component of the language system. Writing necessitates a combination of orthographic, graphomotor, and other language abilities, as well as semantics, grammar, spelling, and writing standards, which are not limited to the aforementioned talents. The advancement of cognitive psychology, particularly metacognition, has attracted the attention of a growing number of scholars and prepared the way for new dimensions in EFL writing, notably in the area of writing achievement. This study seeks to evaluate the impact of applying metacognitive methods on United Arab Emirate EFL learners' writing performance due to the method's high executive aptness, which includes formulation, supervision, and assessment. Sixty-eight students were chosen at random from secondary school to participate in the study's experimental control. The experimental

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_27

group was given metacognitive strategies-based writing training, whereas the control group was given merely regular writing instruction. Both groups were post-tested after five weeks of teaching, and the students were given another post-test at the end of the twelve-week programme. The Wilcoxon Signed-Rank test was used to analyse the data after the independent Mann–Whitney U test. The experimental group's writing performance improved as a result of the study's findings. This study's findings have consequences for both education and future research.

Keywords Control group · Experimental group · Mann–Whitney U test · Metacognitive strategies · Writing performance

1 Introduction

In the United Arab Emirate (UAE), English plays an essential part in education, and students are expected to communicate successfully in institutions where English is the language of instruction. According to Agbaria and Bdier (2021), English is taught as a foreign language in the UAE from kindergarten through the second year of secondary school, and it is a required subject. English is crucial for worldwide communication, social growth, and the adoption of new technologies, in addition to schooling (Li et al., 2021). The Ministry of Education of the United Arab Emirate pays close attention to English education, particularly curriculum and teacher training (Alsharari & Alshurideh, 2020; Alshamsi et al., 2020; Leo et al. 2021; Alshurideh et al., 2019). UAE students, on the other hand, continue to lack good English skills, notably in writing, which is regarded as the most challenging of the four language skills. Despite attempts by educators to remedy this shortcoming, English as a foreign language (EFL) students in the UAE have poor writing abilities (Ibrahim, 2021, Alhamad et al., 2021a, 2021b; Al Kurdi et al., 2020a). Traditional learning methods, such as emphasising grammatical rules, rote learning, and textbook-bound lectures, might be claimed to have demotivated students into passive learners who wait for their lecturers to deliver explicit teaching in the classroom (Fung, 2017; Alshurideh et al., 2020a, 2021).

English teachers assign numerous projects to their pupils to develop their writing skills without teaching them how to apply writing tactics. Before enrolling in any university in the UAE, students must pass English tests in secondary school. As a result, the UAE's principal educational concept is to use curriculum and instructional methods that give pupils fundamental conversational abilities (Frache, 2020; Sultan et al., 2021; Nazir et al., 2021). Because of its importance as an international language, the Ministry of Education approved in the curriculum in 2000 that English would be taught beginning at the age of six (Nguyen et al., 2018). Despite these and other initiatives, however, teaching excellent writing to UAE secondary school students remains a difficulty (Thomure, 2019). Writing is now seen as a means of expressing thoughts and feelings (Monagban and Saul, 2018; Al Kurdi et al., 2020; Alshurideh et al., 2020a, 2020b). It is a difficult and complex activity, but it is a crucial skill

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for EFL students to learn (Nasser, 2018). Its complexity stems from the need to communicate a concept, gain support for it, and then organise and revise information to improve the work's quality and eliminate faults (Geta and Olango, 2016; Amarneh et al., 2021; Akour et al., 2021).

Writing is a methodical, yet recursive, process that includes various sub-skills such as brainstorming, writing, summarising, and editing, whether in the native or second/foreign language (Alazemi et al., 2019; Al-Hamad et al., 2021; Bettayeb et al., 2020). Writing is particularly important in a person's everyday life as well as for the development of other language sub-skills (spelling, vocabulary acquisition, punctuation, expressing thoughts, and accurate grammar usage; Geta and Olango, 2016). Furthermore, writing is typically the major means of evaluating student success. As a result, poor writing abilities have been highlighted as a primary cause of English test failure, particularly when English is studied as a second or foreign language. Poor writing abilities have an impact on performance in practically all disciplines, not just English (Grabe and Kaplan, 2014). From an educational standpoint, research has demonstrated that writing has a major influence on students' academic success (Carmichael et al., 2018). Even when writing is acknowledged as necessary, teachers frequently overlook it, especially in secondary schools in the UAE (Bahari et al., 2021). Writing in English is essential not just for academic objectives, but also for international communication in which ideas and sentiments are expressed sensibly (Namaziandost et al., 2019). Writing improves language acquisition while also improving cognitive abilities due to its multi-process and creative character. Learners engage in both higher and lower-level abilities when writing. (Hoeve, 2022) described the personalities of 'excellent' writers as they plot (brainstorming), reread (rereading), rewrite (editing), and present their work (drafting). Lock et al. (2021) provided similar characteristics, such as planning (brainstorming), translation (putting thoughts into words), and review (evaluation). Writing processes is referred to in Healey and Gardner (2021), as norms, which emphasises that meaning may be formed by developing concepts, choosing the right phrase, and using the right language. According to Vega and Pinzón (2019), the writing process includes content, punctuation, the writer's method, students' ideas, audience, purpose, word choice, spelling, rhetorical structure, mechanics, grammar, and syntactic characteristics. In a similar spirit, Alazemi et al. (2019) described writing processes as involving many exchanges between students aimed at the meaning, structure, method, and arrangement of the message. Numerous studies have shown that EFL students in the UAE have poor writing abilities. Therefore, this study examined the influence of metacognitive strategies training on the writing performance among secondary school learners in United Arab Emirate.

2 Literature Review

2.1 Writing Skills

Writing is a multi-level cognitive activity that requires synchronised attention on various levels: theme, paragraph, phrase, grammatical, and lexical. It is regarded as a mark of competence on a global scale (Kim et al., 2021). Speech is more than the creation of sounds; therefore, it is a talent developed beyond the production of visual symbols. Writing, according to Indrilla and Ciptaningrum (2018), is both a process and a result that involves imagination, focus, and perseverance. It's considered one of the productive language skills since it demands students to use the language, they've learned to create something. Writing is a key language skill, and it is one of the four major language skills: writing, reading, speaking, and listening (Balta, 2018). Writing competence, according to Kim et al. (2021), is the hardest output ability for an EFL learner to achieve. It is the most comprehensive way of evaluating pupils' performance. Poor writing abilities have been highlighted as one of the key issues for students' failures in English language exams, particularly in circumstances where English is taught as an ESL or EFL. It's one of the most difficult aspects of language learning (Khair & Misnawati, 2022). Poor writing abilities have an impact on students' success in practically all disciplines, not just English (1). Additionally, writing is one of the four talents of the English language that must be considered and not overlooked (Baisov, 2021). Most significantly, writing is seen as a tool for language growth, creative development, and learning extension in all disciplines (Abdul Rahman, 2013). Writing, according to Hyland (2015), is a process in which writers explore their thoughts and ideas and make them visible for others to read. Spelling, punctuation, mechanics, vocabulary, substance, structure, purpose, and, most importantly, the audience should all be addressed in good writing (Hyland, 2015). The inability of non-native students to write decent English can be linked to a lack of language knowledge (Jahin & Idrees, 2012). In other words, writing is the final step in evaluating a student's achievement at practically all stages of education, particularly for a transition, grading, and admission tests. It is a talent that allows pupils to best display their language proficiency and control.

Students' weak writing abilities have been recognised as one of the key causes influencing students' failures in English Language tests in the previous study in SL/FL situations (Bennui, 2016). It may be claimed that poor writing ability has an impact on students' success in practically all of the areas they study as an applied phenomenon (Daud et al., 2016). The issue of students failing to study or performing poorly in exams in connection to writing piques the interest of second language researchers. Researchers have long held the belief that learning to write is a tough, sophisticated, and complex process that necessitates rigorous practises that may be learnt directly via experiences (Aliyu et al., 2016; Buyukyavuz & Cakir, 2014).

2.2 Learning Strategies

O'malley et al., 1990) describe learning strategies as "unique ideas or behaviours that individuals utilise to perceive, remember, or retain new knowledge". "Actions, behaviours, procedures, or strategies pupils adopt, sometimes subconsciously, to assist their development in apprehending, internalising, and applying the L2," according to Oxford (1994). Different learning techniques were presented and tried during the learning process. In the 1980s and early 1990s, research mostly concentrated on classifying the tactics discovered in previous decade's studies. As a result, numerous taxonomies for classifying them have been proposed, including classifications of language learning techniques in general and language sub-skills strategies specifically. For example, O'malley et al. (1990) categorised the strategies into three categories: cognitive, metacognitive, and socio-affective, each of which comprises a variety of sub-strategies including rehearsing, organising, summarising, deducing, and visualisation. (Oxford, 1994), on the other hand, presented a more complete model with six components divided into two groups: direct and indirect. Memory, cognitive, and compensatory techniques are direct strategies, whereas metacognitive, emotional, and social strategies are indirect strategies. The social and affective tactics are less common in L2 research, according to Oxford and Shearin (1994). This might be because L2 researchers don't often study these behaviours, and learners aren't used to paying attention to their own sentiments and social interactions as part of the L2 learning process. Finally, according to O'malley et al. (1990), cognitive (e.g., translating, analysing) and metacognitive (e.g., planning, organising) methods are frequently utilised in tandem, supporting one another. The notion is that combining methods has a greater impact than adopting single techniques. The contrasts between cognitive and metacognitive strategies are significant, as (Schraw and Graham, 1997) pointed out, partly because they assist us to determine which strategies are most relevant in determining the success of learning. (Schraw and Graham, 1997) argued that metacognitive methods, which enable students to plan, manage, and assess their learning, play the most important role in learning progress. "Developing metacognitive awareness may potentially lead to the development of greater cognitive skills," (Anderson, 2002) contended.

2.3 Metacognitive Strategies

2.3.1 Planning

One of the distinctive metacognitive tools for boosting learning is planning. The use of planning as a method improves students' goals and the effectiveness with which they may be achieved (Flavell, 1987; Okoro, 2011). For this purpose, proper learning may be achieved through the wise use of resources that have an impact on performance. Setting objectives, reviewing appropriate information, questioning,

and task analysis are all part of the planning process. As a result, students arrange their studies to create the ideal learning environment. This allows kids to concentrate on their studies and build tactics that are relevant and suited for them (Suskie, 2018). In other words, planning comprises the use of strategic approaches in the allocation of resources to influence performance, as well as effectively selecting strategies and distributing resources to have a favourable impact on task performance. As (Steiner, 2010) correctly pointed out, predictions may be formed before writing, planning sequencing, or allocating time to properly complete any activity. Kellogg (Kellogg, 2008) focused on a detailed examination of the differences between good and bad writing. According to the findings, more experienced writers can plan successfully regardless of text "content," but weak writers can't. These findings have implications for the regulating metacognition developmental process.

2.3.2 Monitoring

Monitoring denotes a process of thorough awareness and follow-up in the completion of work. Monitoring is associated with the capacity to gradually develop pupils in research (Kazemi, Franke and Lampert, 2009). Several recent research, however, has discovered a robust link between metacognitive knowledge and monitoring accuracy. (Pearson, 2014) found that people's ability to predict how well they will grasp a text before reading was associated with monitoring accuracy during a post-reading understanding assessment. Similarly, Hoffman and Spatariu (2008) looked at the abilities of fifth and sixth graders to solve computer tasks. This study included three groups, with the findings revealing that the monitored problem-solving group answered more complicated issues faster than the other two. Monitoring, according to Andrade and Cizek (2010), is keeping track of progress toward a goal of improving performance. It's also important to maintain track of the learning process. Understanding pupils' comprehension issues and how to successfully address them may be determined with the use of monitoring (Sun, 2013).

2.3.3 Evaluating

The process of assessing the success of a particular strategy in accomplishing organisational objectives and taking corrective action when necessary is referred to as evaluation. The task evaluation is the final phase in the strategic management process. Examining the basic foundations of a task approach, comparing actual outcomes to predicted results, and taking remedial actions are the main assessment tasks. The purpose of the evaluation is to ensure that the organisational strategy, as well as its execution, achieves the goals of the organisation. Strategy evaluation is just as important as strategy design since it reveals the comprehensive plans' efficiency and effectiveness in reaching the targeted outcomes. In the assessing stage, students reflect on their work and the techniques, tools, resources, and/or procedures they

used. According to Schmitz et al. (2004), reflection is transmitted when it is carried out, or "reflection-on-action."

2.3.4 Metacognitive Strategies and Writing

Expert reaction to problem-solving in general (Sternberg, 1984), as well as expert writing, has been identified as a component of metacognitive methods (Flavell, 1979; Scardamalia and Bereiter, 1984; Brown, 1982). In comparison to inefficient writers, proficient writers are more mindful of what they write, make more decisions about planning and regulating as they write, and are more likely to self-evaluate their writing as they write. It's crucial to think about the link between cognitive and metacognitive techniques that a strategic writer uses to understand the importance of metacognitive strategies in writing. When it comes to performing writing assignments, an effective writer employs a variety of cognitive methods. Learners can use cognitive techniques to assist them reach their cognitive goals (Flavell, 1979). Brainstorming ideas, constructing an outline, prewriting, writing the first draft, composing effective sentences, and correcting for grammatical problems are all examples of cognitive methods for crafting. Metacognitive techniques, in contrast to cognitive strategies, are intended to track cognitive growth. To coordinate their participation in the writing process, student writers use metacognitive processes or methods (Butler, 1998). Analyzing policy, the writing task to determine what is required, making plans underwriting strategies to use in a given writing task (e.g. determining whether brainstorming is required), monitoring success (e.g. judging whether sufficient ideas were generated during brainstorming), and selecting remedial strategies are examples of metacognitive strategies for writing (e.g. deciding that more research is needed to gather ideas). In a nutshell, strategic writers (and learners) employ cognitive methods to accomplish a specific writing objective and metacognitive strategies to guarantee that the cognitive writing goal is reached (Butler, 1998; Livingston, 1996). While performing writing tasks, efficient writers may switch between cognitive and metacognitive activity. As a result, teachers should assist students in developing metacognitive techniques in order for them to become effective writers. Instead of offering a list of teaching tactics and exercises, the researcher in this study would want to offer metacognitive writing module recommendations to EFL writing instructors who want to include metacognition into their writing classes.

2.3.5 Writing Performance in EFL Context

In an EFL framework, writing is the most important ability (Cai, 2017). Writing is a talent that is used to evaluate students' performance at all stages of education: primary, secondary, and tertiary, as well as admission tests, application letters, and research thesis, and for a variety of other purposes (Ei et al., 2016; Tabatabaei and Assefi, 2012). However, grammatical accuracy determines the efficiency of any work, as syntactic ambiguity leads to semantic uncertainty. Mechanical issues in the script;

correctness of grammar and lexis; style of writing to the needs of the scenario; and developing the ease and comfort in expressing writing form are some of the causes for incapacity to write (Bilal et al., 2016). For foreign languages, the level of difficulty in writing is substantially higher (FL). When writing, differences in linguistic patterns, ways of expressing concepts, writing styles, and culture are all important considerations. Without a doubt, writing is a cognitive ability that takes into consideration mental functioning and requires the administration of a diverse set of abilities, writing processes, and writing methods (Willinsky, 2017). However, current procedures in UAE secondary schools seldom take these complicated sets of abilities into account (Al-Abed Al-Haq and Al-Sobh, 2012). Furthermore, some teachers provide written assignments to students without providing them with clear directions on how to write or writing skills that would aid their learning (Alhabahba et al., 2016). Students skipped the writing part in the Tawjihi English Exam, according to Tahaineh and Daana (2013) and (Nazzal, 2020), since the exam does not aid them in the future. The scores of the English Tawjihi English Exam were poor, and student's performance in the writing work improved slowly.

Many elements can contribute to students' difficulty in writing TEE, including their competency in English language skills, particularly writing as a primary strategy, measuring students' performance, motivation, anxiety, and L1 transfer. Students who take the Tawjihi English Exam usually grumble about how difficult the writing component is (Al-Sawalha and Chow, 2012). Writing tasks, according to Magogwe (2013), is a significant barrier for secondary school students during their studies, since pupils struggle to cope with learning challenges, notably during the TEE. As a result, because writing is a component of TEE, it cannot be overlooked. The TEE comprises two papers, according to Dweik and Awajan (2013), the first test includes two primary sections, reading comprehension and vocabulary. The structure and content are based on the second language. A lot of academics have argued that pupils need additional assistance with their writing abilities (Hanjani and Li, 2014; Montgomery and Baker, 2007). This will also assist them further their studies and professional growth in the future. As Price-Dennis et al. (2014) pointed out, many students avoid taking the English test, particularly the written composition element, which is thought to be the most difficult. This issue, however, is not restricted to public schools; it also affects private educational institutions (Silva and Graham, 2015). Students generally overlook the writing segment, according to Khoshsima et al. (2014), due to their incapacity or lack of confidence in producing strong and proper sentences, cohesive paragraphs, and a well-structured written expression. Similarly, (Salem, 2018) concluded that the majority of UAE students lament their low English writing skills. According to Salem (2018), it is extremely difficult for UAE secondary school students to produce a decent sentence since they lack the necessary writing skills. For both native and non-native pupils, writing properly is a significant task (Muslim, 2014). Writing in English has become a valuable talent in Arab nations, even though it is more difficult for Arab pupils (Al-Bahrani, 2014). For Arab pupils, it is a foreign language that is very different from their tongue. Similarly, because writing is such a tough and complex endeavour, it is the most difficult of all skills to master. However, writing in English among Arab students is

difficult. They are more likely to make mistakes (Muthanna, 2016). As a result, Arab English learners, including UAE, have significant difficulties with writing abilities. Researchers such as (Salem, 2018) and (Al-Bahrani, 2014) have explored this issue (2014). The main obstacle to successful writing among Arab students, particularly in the UAE, is a lack of meaningful and cohesive ideas (Abdo and Breen, 2010; Bani-Khaled, 2013).

3 Methodology

The participants in this study were 68 EFL students in their last year of secondary school at Rashid School for Boys in Dubai. They were in secondary school at the time. Two researchers used a holistic scoring system to measure their language skills. For 12 weeks, the class met for around two hours each week. A variety of instruments were employed in this study, including a pre-test, an immediate post-test, and a delay test. The test question was taken from the course materials, which they understood to be their current study's sourcebook. Because their educational programme had pre-placed the students in two separate interactive courses, one was designated as the control group and the other as the experimental group. The experimental group got writing instruction based on metacognitive methods, whereas the control group received just ordinary writing instruction. Both groups were promptly post-tested after five weeks of teaching. At the end of week twelve of the teaching programme, both groups are given a delayed post-test. To determine the impact of the metacognitive technique on writing performance among EFL learners, the data were subjected to a Mann-whiny u test followed by a Wilcoxon signed-rank test. All participants in this study were given a writing performance pre-test. The students were given a topic to write on in an essay format of roughly 150 words. After that, the experimental group received 35 min of instruction on metacognitive learning processes.

4 Results

Table 1 showed descriptive statistics based on mean, standard deviation, and standard error for total scores for general writing skills in both groups. According to their writing performance at the start of the study, the Pre-Test mean scores of the experimental group (M = 4.08, SD = 1.651, SDE = 0.321) and the control group (M = 3.11, SD = 0.631, SDE = 0.128) were not significantly different. After five weeks, an intermediate post-test was conducted with the experimental group mean scores of the experimental group (M = 4.84, SD = 1.660, SDE = 0.354) and the control group (M = 3.66, SD = 1.602, SDE = 0.341). Then, at the end of the intervention, a delayed post-test was conducted with the experimental group (M = 4.96, SD = 2.373, SDE = 0.273) and the control group (M = 3.90, SD = 1.565, SDE = 0.334). These results showed a difference in the mean scores between groups.

Table 1 Descriptive statistics for writing proficiency

	Group	N	M	SD	Std. Error
Pre-test	Experimental group	34	4.08	1.651	0.321
	Control group	34	3.11	0.631	0.128
	Total	68			
Immediate post-test	Experimental group	34	4.84	1.660	0.354
	Control group	34	3.66	1.602	0.341
	Total	68			
Delayed post-test	Experimental group	34	4.96	2.373	0.273
	Control group	34	3.90	1.565	0.334
	Total	68			

Further analysis was conducted to determine the effect size of metacognitive strategies on the overall performance of participants. Since the scores were not normally distributed, the Mann–Whitney U test, the non-parametric counterpart of a one-way independent ANOVA, was used to find any possible difference between the groups at the beginning and end of the program. The Wilcoxon Signed-Rank test was used to examine within-group differences. To establish the homogeneity of the groups in terms of their overall writing performance, a Mann–Whitney U test was carried out.

As illustrated in Table 2, this test found no significant difference in the overall pre-test scores of the two groups ($U = 148.54$, $z = -2.051$, $p = 0.045$, $r = -0.351$). The mean score margin between the two groups was not reasonable. Meanwhile, the effect size ($r = -0.351$) indicated a small effect between the groups considering the threshold of Cohen's benchmark for large effect size.

Table 3 presented the results obtained from the immediate post-test. This test was conducted to determine if there was a significant difference between the experimental group, which received metacognitive instruction, and the control group, which did not, at the intermediate stage of the training program.

The Mann–Whitney U test (independent sample U test) was employed to measure the difference in mean scores between the two independent groups to illustrate the effect size of the differences between groups. The results revealed a significant difference in the overall scores between groups ($U = 25.876$, $z = -4.889$, $p = 0.000$, $r = -0.838$). The difference observed in the mean rank value though comparing the two groups' performance revealed the difference was significant. Meanwhile, the

Table 2 Between-group overall scores for pre-test

Group	*N*	Mean Rank	*U* value	*z* value	*p*-value	*r* value
Experimental Group	34	36.87	148.54	−2.051	0.045	0.351*
Control group	34	21.65				
Total	68					

Note. * $p < 0.05$

Table 3 Between-Group Overall Scores for Immediate Post-Test

Group	*N*	Mean Rank	*U* value	*z* value	*p*-value	*r* value
Experimental Group	34	44.62	25.87	-4.889	0.000	−0.838*
Control group	34	30.22				
Total	68					

Note. * $p < 0.05$

r-value (−0.838) showed a medium-to-large effect size. The delayed post-test was the final test administered to both groups in Table 4. It aimed to examine the impact of metacognitive strategies on the experimental group and their effects on the writing performance of EFL students in general. The Mann–Whitney U test results revealed a significant difference in the performance between groups ($U = 11.65$, $z = -5.478$, $p = 0.000$, $r = -0.939$). The difference in mean rank value between the experimental group ($M = 56.77$) and control group ($M = 48.91$) was significant, and the wide margin between the two means indicated the impact of the metacognitive instruction received by the experimental group. Meanwhile, the *r*-value (−0.939) showed a medium-to-large effect size.

The Wilcoxon Signed-Rank test in Table 5 showed a significant difference in the gain score of the experimental group's performance on the pre-test ($t = 1.988$, $z = -2.312$, $p = 0.038$, $r = 0.393$) before and after metacognitive instruction. The results showed that instruction with metacognitive strategies had a significant effect on the writing performance of this group. The *p*-value (0.000) indicated the relationship was statistically significant. According to these results, the experimental group made significant progress between the pre-test and immediate post-test. Furthermore, there was a large effect size ($r = 0.393$) from metacognitive strategies.

Table 4 Between-group overall scores for delayed post-test

Group	*N*	Mean Rank	*U* value	*z* value	*p*-value	*r* value
Experimental group	34	56.77	11.65	−5.478	0.000	−0.939*
Control group	34	48.91				
Total	68					

Note. * $p < 0.05$

Table 5 Within-group overall scores for experimental group (pre-test with immediate post-test)

	N	*t* value	*z* value	*p* value	*r* value
Before	34	1.988	−2.312	0.038	0.393*
After	34				
Total	68				

Note. * $p < 0.01$

Table 6 showed the results of comparing the overall scores of the experimental group between the pre-test and delayed post-test. The Wilcoxon Signed-Rank test was used to examine the difference in the gain score and to find the effect size of metacognitive strategies on writing performance. The results ($t = 2.150$, $z = -2.769$, $p = 0.000$, $r = 0.475$) revealed that metacognitive instruction had a significant effect on the group's overall writing scores. In addition, there was a large effect size ($r = 0.475$) from metacognitive strategies.

These results revealed statistically significant differences in the experimental group's performance during and after the intervention, $p < 0.05$, with a large effect size ($r = -0.628, -0.630$). This indicated tremendous improvement by the end of the course and that metacognitive instruction had a major impact on the writing performance of EFL learners. A Wilcoxon Signed-Rank test was likewise run to compare the control group's gain score before and after treatment. As shown in Table 4.14, there was a significant difference in the group's gain score in the immediate post-test ($t = 2.871$, $z = -3.632$, $p = 0.000$, $r = -0.623$). These results indicated that non-metacognitive methods could also improve the writing of EFL learners in UAE high schools (Tables 7 and 8).

Another Wilcoxon Signed-Rank test examined if there were statistically significant differences in the control group's performance in the delayed post-test (see

Table 6 Within-group overall scores for experimental group (pre-test)

	N	*t* value	*z* value	*p* value	*r* value
Before	34	2.150	−2.769	0.000	0.475*
After	34				
Total	68				

Note. * $p < 0.05$

Table 7 Within-group overall scores for control group (pre-test with immediate post-test)

	N	*t* value	*z* value	*p* value	*r* value
Before	34	2.871	−3.632	0.000	0.623
After	34				
Total	68				

Note. * $p < 0.05$

Table 8 Within-group overall scores for control group (pre-test with delayed post-test)

	N	*t* value	*z* value	*p* value	*r* value
Before	34	3.880	−4.621	0.000*	0.792*
After	34				
Total	68				

Note. * $p < 0.05$

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Table 4.15). The results ($t = 3.880$, $z = -4.621$, $p = 0.000$, $r = -0.561$) showed a significant difference between the gain score before and after the teaching program and a small effect size ($r = -0.792$).

5 Conclusion

The rationale for this research was that teaching meta-cognitive learning methods may help students enhance their writing skills. The course lasted for a total of twelve weeks. During this period, the researcher used metacognitive learning techniques and taught the experimental group members how to use metacognitive tactics in their writing. During their writing skill practise, the participants in the control group, on the other hand, received no training on how to employ these tactics. The findings of the post-test revealed that teaching meta-cognitive learning techniques increased the learners' writing ability. The experimental group that employed metacognitive learning methodologies outperformed the control group in terms of writing ability. Metacognition was found to be a key driver of English writing proficiency in recent research. implementing metacognitive activities entails delegating some obligations to students, which may increase their stress levels, particularly among the less capable. As a result, it is advised that clear and simple instructions and modelling, as well as monitored practise, be easily available. When teaching metacognitive EFL writing, the teacher should encourage and motivate students, as well as listen to their voices from various locations to manage and access the teaching tactics used. Furthermore, cultural influences may complicate the scenario of putting metacognition into practice, necessitating greater research in this area. Promoting metacognitive awareness among students in an integrative EFL writing class entails that the process and consequence of methods are not seen as adversarial, but rather as complementary (Mbato, 2013). It also aids teachers and students in accessing and regulating their efforts, resulting in a more productive EFL writing session. Nevertheless, as students' understanding of and experience with techniques grows, genre approaches may be linked as "a continuation of product approaches" to link writing with distinct social settings, according to Byrnes (2012). Writing ability is critical, yet it is a difficult academic talent to master for secondary and college students. An in-depth evaluation of students' writing abilities, with a focus on persuasive writing assignments, provides additional insight into the cognitive processes of writing performance as they improve.

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Perspectives of Online Education in Pakistan: Post-covid Scenario

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Abstract The outbreak of the famous Corona Virus in the world at the end of the year 2019 has triggered the world to bring major changes to the everyday walks of life. This virus entered Pakistan in February 2020 and resulted in the lockdown to be enforced throughout the country. Just as many other fields of life, the education sector also had to tolerate a massive hit of this closing down. The traditional approach of education based on the face-to-face interactions between the students and instructors went dependent on online platforms. This was a major and sudden switch, which was found extremely difficult throughout the world as well as in Pakistan. The concept of online education was not anything new. It prevailed earlier also, but that was the one conducted after proper planning, which was not at all in the case Covid-19. This research paper first discusses the perspectives of parents and teachers on the effectiveness of online education by qualitative approach. Secondly, the results of

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_28

the conducted surveys are evaluated in the quantitative part of the paper. Further, the results of both the research types are compared to discuss and reason the overall scenario of online education in Pakistan.

Keywords Online education · Education · Post-Covid · Stakeholder's engagement · Scenario planning · Survey

1 Introduction

The global spread of the notorious Coronavirus has transformed the way things used to work out (Alshurideh et al., 2021a; 2021b). All the major fields linked with the economic growth of countries have been highly affected by this life-threatening virus. One of these affected sectors, is educational sector (Alshamsi et al., 2020; Alsharari and Alshurideh, 2020). At the start of Covid-19, the provision of education seemed to be a huge challenge (Al-Hamad et al., 2021; Leo et al., 2021). Schools, colleges, and Universities were shut down immediately after the outbreak of this epidemic (Akour et al., 2021; Alshurideh, et al., 2021c). Then, just as everything else, education went online, but it did never resolve all the related issues anywhere around the world (Al-Maroof et al., 2021; Alshurideh et al., 2021c). Never before have we witnessed educational disruption on such a large scale (Demuyakor, 2020; Sultan et al., 2021). This statement coming from a man on such an effective post indicates that the sudden change from traditional to distance learning had been a huge dare for all the countries around the globe (Al Kurdi et al., 2020a; Nazir et al., 2021). Different countries had to face distinguished challenges for assuring the continuation of providing education to its students (Alshurideh et al., 2019; Kurdi et al., 2020b).

The Covid-19 confirmed entering Pakistan when its first case was filed on 26th February 2020 (Abid et al., 2020). Although the growth of these cases was at a slow pace, as a precautionary measure, the Government of Pakistan soon declared the closure of all the educational institutions. Initially, everything appeared to be a blackout. Then, few private institutes started to shift from conventional to distance learning within their limited resources. But most institutes in Pakistan were not able to manage and tolerate this major switch. For a developing country like Pakistan, where education is already under some extensive considerations, Covid-19 proved to be a nightmare. A great many issues had to be endured in making online education possible (Al Kurdi et al., 2021, 2021b; Alshurideh et al., 2020a, 2020b, 2020c). Most of the Government institutes, were not able to go online. They simply did not have the required resources. Even some of the well-known universities of the country completely called off education for a few months until they assured the availability of adequate resources. Many institutes did their best for the continuance of providing education to their students, but they also had to cross some major barriers. There exist some marked commons amongst the institutes, who completely got closed for education and those who went online (Bettayeb et al., 2020; Salloum et al., 2020). The availability of resources is the most highlighted amongst these common issues. All

the institutions had to manage their resources smartly. Apart from the accessibility of resources, there lived some other crucial factors, which markedly affected the education system and the quality of education. (Alnazer et al., 2017; Alshurideh et al., 2020a, 2020b, 2020c; Alzoubi and Ahmed, 2019; Mehmood et al., 2019). This research paper will uncover all these occurred issues and their impact levels in various situations.

This research study intends to examine the overall scenario of online education in Pakistan after the occurrence of Covid-19. This paper focuses on the impacts put up by the unexpected shift from traditional to online education on the stakeholders in many diversified ways. For this purpose, surveys were conducted to learn what do most Pakistani parents and teachers have to say about the overall scenario of distance learning. The overall scenario means the combination of all the related factors that have been associated with online education in Pakistan. These factors include finance, accessibility to the resources and the seriousness of students towards education, while sitting at their homes, connectivity issues, communication challenges, and most importantly the effectiveness of education.

In Pakistan, not all the parents are well-educated, so, when it comes to online education of children especially the younger ones, it is extremely important to figure out that how much computer literate the parents are because they can guide their kids in accessing the devices and facing various associated difficulties, only when they themselves know how to tackle with the possible situations (Alzoubi and Yanamandra, 2020; Alzoubi et al., 2020a, 2020b). Also, in the case of online education, where teacher-student communication has been curtailed in comparison to live-learning, the role of parents in helping their children in their studies has grown high. This issue is not only on the parent-end, but also many teachers are not much habitual of using the digital platforms (Akhtar et al., 2021; Al Ali, 2021; Alhamad et al., 2021; Joghee et al., 2020b). So, finding out the education level and computer literacy rate of parents and teachers of different levels and relating them with the flow of online classes is important. Moreover, the availability of resources like digital devices, and the Internet, which are also the precautionary measures to avail as well as conduct online education also bring various issues related to finance, access, connectivity, and experience. So, we have viewed online education in consideration of such crucial factors (Ahmad et al., 2021; Alameeri et al., 2021; Nuseir et al., 2021a, 2021b). Furthermore, getting to learn and understand the psychological approach and interest level of students regarding education while sitting at home is also one major consideration covered in this research work. So, based on the literature review and the received survey responses, this research paper argues upon many diversified factors that have their impact on the effectiveness and fruitfulness of online education in Pakistan. Different education levels have their distinguished as well as common problems and the impact levels of these problems on the quality and potency of education are also quite different. This paper does not discuss the point of view of the organizations that how do the management of educational institutes view online education in the post Covid-19 scenario.

2 Literature Review

Education is an essential human virtue, a necessity of society, the basis of good life, and the sign of freedom. Education is important for the integration of separate entities. It plays a significant role in designing a successful life for an individual. Not only does it open the doors of financial stability in an individual's life but, it also provides him/her with the platform to grow socially, and ethically. It also develops a sense of responsibility, self-respect, and strength in an individual (Bhardwaj, 2016). Also, education is strongly associated with a country's economic development. Pakistan is a developing country, where the educational sector is already struggling to prosper. There exist many considerable issues in the educational system of the country. The year 2020 added one more to the list of these concerns in the face of Covid-19 (Alshurideh et al., 2020a, 2020b, 2020c; Amarneh et al., 2021; Ashal et al., 2021).

Coronavirus is a powerful pandemic that forced even the strongest of economies to get themselves shut (Aljumah et al., 2021a; Nuseir et al., 2021a, 2021b). Locking down the cities was one ultimate possible solution to hold the spread of Covid-19 (Al-Dmour et al., 2021; Al Khasawneh et al., 2021a, 2021b). Governments of almost all the countries throughout the world decided to declare shutting down every-day life activities so that people could stay at their homes, which was necessary to reduce the spread of the concerned epidemic (Al Khasawneh et al., 2021a, 2021b; Murphy, 2020). This very situation rose the switch of traditional approaches to move online. Just as many other aspects of every-day life, education also shifted from live to online (Ali et al., 2021; Alnuaimi et al., 2021). Schools, colleges, and universities around the world were closed and students were directed to avail distance learning. This sudden switch between conventional to virtual learning was not easy at all. Different educational institutes took diversified amounts of time to accomplish this task in accordance with their capacities (Bestiantono et al., 2020). But, since this epidemic is completely unpredictable, no one knew when it would end, therefore despite all the obstacles, it was extremely necessary to take all the possible measures to provide students with online education (Crawford et al., 2020).

Online education is education that is carried out over the internet and students receive education at their homes. It is often known as e-learning and is the newest form of distance learning (Stern, 2020). It is focused on the concept of facilitating and earning education remotely. For this very purpose, different on-net platforms were used including Zoom, Skype, Microsoft Teams, Google Meet, etc. This research study is most concerned about the level of effectiveness of education, which has more to do with deep thinking and successful stakeholders rather than the involvement or delusion of technology (Serdyukov, 2020). The two most concerned groups involved in the process of education are of teachers and students. These two groups are highly emphasized when any discussion regarding education is carried out (Alsharari, 2021; Alzoubi, 2021a, 2021b).

A famous educator Andrew suggested that technology is human dependent. It is up to the instructor that how does he/she uses it to deliver the learning concepts (Kemp et al., 2014). Tools are there but every teacher uses it in diversified ways in

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order to convey knowledge to the students. Also, it depends on the students that how do they perceive learning online. (Semler, 2010) suggested that online education is effective for the students who are matured, prompted, and self-mastered. Even in the traditional learning environment, the promptness of students is highly notifiable (Serdyukov, 2020), but when it comes to distance learning, the students must make sure to enhance their time-management and self-management skills (Semler, 2010). When talking about online education, one must consider this very fact that it falls under two categories (Alzoubi and Aziz, 2021). The first one is normal online learning, which is properly pre-planned and the second one is emergency online learning (Hodges et al., 2020). The scenario faced after the global pandemic of Coronavirus is of "*emergency online learning*" which happened suddenly without any prior notice period (Alnuaimi et al., 2021). One important thing to notice is that even the seriousness, motivation, and interest levels of the teachers as well as the students are controlled by various psychological, environmental, and material drivers (Alzoubi et al., 2021; Aziz and Aftab, 2021; Cruz, 2021). Some of these driving factors are discussed below and their impacts on the effectiveness of education are grouped by primary, secondary, and higher education levels.

2.1 Students' and Parents' Perspectives

This part of the paper focuses on the perspectives of students and their parents, when it comes to the switch from traditional to online education. Students enrolled in different education levels as well as their parents had to face contrastive sorts of problems. The most common amongst these are discussed here.

2.1.1 Learning Environment

The learning environment comprises all the things that are around a learner, while he/she is involved in the process of gaining education. In the traditional approach, mostly the classroom environment is observed. The classroom environment is formed by combining various classroom standards including the presence of table-chair discipline, the proper seating arrangement of the students, such that, each one of them could view and acknowledge the instructions easily and clearly, and the presence of teacher as an instructor as well as an authorized controller (Sieberer-Nagler, 2015). These pennants are followed to minimize disruptions, which ultimately leads to maximized learning as such factors are closely associated with the involvement and intellectual activeness of the students as well as of the teachers. Research shows that the students are emotionally attached to their classrooms. This emotional devotion has a strong impact on the performance and understanding levels of the students. The level of this sentimental bond of students with the classroom varies amongst students of different education levels (Khajavy et al., 2018; Sandilos et al., 2017). It is more

likely believed that the students of primary classes have a much warmer relationship with their classrooms in comparison to the students of higher education levels. Research shows that the classroom environment formed by the kids and the kindergarten teachers helps in establishing a positive cognitive climate (Gkloumpou and Germanos, 2020). Younger kids are more into asking questions, responding back to the questions of their teachers, and in expressing their thoughts and opinions when they are in a productive and welcoming classroom environment (Gkloumpou and Germanos, 2020; Johnson and Johnson, 2002). The active participation really adds up a lot in the learning process. The students of secondary and higher education levels also have a close relationship with their institutes and classrooms. The relationship between classroom and the learning environment is marked significant because the fashioned environment holds a huge impact on the behavior and performance of the individuals (Castilla et al., 2017; Scott-Webber et al., 2000)The classroom environment comes under traditional teaching methodology but, when it comes to online education, the classroom setup disappears. Now, students and their house members are held responsible for creating a suitable environment for learning at homes. For the kids of primary education level, especially till grade II, establishing a learning environment for themselves on their own is quite impossible. The dependency of younger students on their elders really puts many more points of consideration. For a healthy learning environment, it is extremely significant that everything goes smoothly (Chen et al., 2020) and that in the case of online education is possible only when people are good at dealing with computer and connectivity-related issues (Eli, 2021). In Pakistan, most parents do not use digital devices too often. Hence, they are not much familiar and prompt in resolving related problems. During online classes, if students face disruptions, they are more likely to get distorted and lose interest in even attending their classes. Furthermore, following a proper table-chair discipline is also considered important, which has been found lacked during the online classes of school students. Secondary and higher education students are grown-up and are expected to solve the online classes' related issues themselves with little or no help from the elders (Farouk, 2021; Ghazal et al., 2021). This reduces the influence of parents being less aware. Moreover, while the students are gaining education by staying at their homes, it is a must that proper disciplined study environment is provided to the adult learners because higher education demands students to be focused (Kara et al., 2019). Here comes the responsibility of the parents and other house members that they aid in creating such a healthy environment in homes that students can easily focus on their studies. Maintaining a proper table-chair discipline is important. Discipline is part of the values of the learning environment and discipline is extremely significant for staying focused, and productive "ecole_admin".

2.1.2 Student–Teacher Relationship

Student teacher relationship is extremely significant in enhancing the abilities and strengths of students especially during school years. Teachers have a huge impact on student's social, emotional, and intellectual experiences. For being able to promote

the cognitive processes effectively, it is important that the teachers understand the emotional behavior, strengths, and weaknesses clearly. School students especially those enrolled in primary classes are found to have a very friendly and strong relationship with their teachers. During the conduction of live classes, this relationship is strengthened day-by-day and such a learning environment is created which encourages the learning process. School students spend a good amount of time with their teachers at schools where they are socially, emotionally, and intellectually understood and trained. In the presence of their teachers, school students tend to pay more attention to their studies than they do in their absence. The presence of teachers puts a positive impact on young minds and holds a huge influence on the way they behave and think (Koca, 2016) (Vandenbroucke et al., 2018). Secondary and higher education level students need more understanding of concepts. This is found to be more convenient when the teachers and students are having face-to-face interaction because students feel motivated and encouraged when their teacher/instructor is in front of them (Vandenbroucke et al., 2018). Higher education is found to be more impactful when there is active participation of the students during their classes. After the shift of traditional classes to online classes, students and teachers are now left only digitally connected. Various problems like dis-connectivity issues and communication problems have been found to weaken the bond between the students and instructors (Joghee et al., 2020a). School student's especially primary level kids have missed this all-important teacher–child relationship during online classes. The gaps between students and teachers have forced parents to get more focused on the education of their kids. Effective online education has put up the demand for parents to be more tolerant, responsible, helpful, and observant towards the education of their children.

2.1.3 Access to Online Education

Attaining online education requires the availability of some resources including digital devices, fast and stable internet connection, and a sustained supply of electricity. Without these resources, it gets impossible to gain access to online classes. This platform-associated apprehension holds a significant effect on students' as well as parents' satisfaction and interest in attending the online classes which ultimately affects the effectiveness of education (Chen et al., 2020). In Pakistan, issues regarding the non-availability of electronic gadgets and non-attainability of internet connection are common. Pakistani parents had to face multiple difficulties in assuring the availability of devices and accessibility of the internet to facilitate the education of their children. This non-synchronous availability of resources amongst the students creates an atmosphere of socio-economic inequality (Hasan et al., 2021; Qureshi et al., 2012). The financial burden is one major concern faced by most Pakistani people. Arranging suitable digital devices and good internet connection with appropriate bandwidth is one big concern of online education (Qureshi et al., 2012). In case of non-availability of appropriate gadgets or bad internet connectivity where dis-connectivity and distortion kind of issues are faced too often, makes the students

of all ages unfasten their interest in attending the online classes. This irritation, dissatisfaction, and perplexity amongst the students conclusively result in the lack of effectiveness of education. One big issue in Pakistan is load-shedding which cannot be neglected when it comes to online education. Uninformed load-shedding results in many related problems like devices remaining uncharged, internet not working because of the unavailability of devices, etc. The only solution to this which can be adopted by the parents is to arrange generators or UPS at their homes so that the classes if their children do not get missed in case of load-shedding. This again demands a strong financial background which is not common in developing countries like Pakistan (Qureshi et al., 2012).

2.1.4 Level of Awareness and Computer Literacy

The level of expertise in computer technology is an important factor in successfully adopting technology. Research suggests that the more proficient the user is in using the computer and technology, the more welcoming would he/she be towards e-learning (Qureshi et al., 2012). Hence in the case of online education especially when it is the case of an emergency switch, it is extremely important to examine the level of awareness and computer knowledge of the parents and the students. When it comes to younger students who are not very familiar with the requirements, the parents are expected to be very good at using the computers and the internet because only then would they be able to provide assistance to their kids. In Pakistan, most of the parents are not efficient at using computers. Especially the mothers who are at homes during the conductance of online classes do not know much about dealing with the technology. This causes puzzlement and the process of attainment of education is hindered which results in the irritation of young minds. This ultimately results in the lack of effectiveness of learning. The students of secondary and higher education levels are much familiar with the technology and are expected to handle the issues on their own.

2.2 Teachers' Perspectives

This part of the paper focuses on the perspectives of Pakistani teachers related to online education post-Covid-19. Teachers own a prominent position, when it comes to education. Hence, examining the satisfaction-level of the teachers teaching various education levels is extremely crucial in determining the effectiveness of online education. The measure of this effect depends on various factors. Some of them are analyzed here.

2.2.1 Face to Face Interaction with Students

Face-to-face interaction with students is one of the most elementary aspects of the learning environment. Research shows that it is important for teachers to examine the facial expressions of the students. Different students take things differently and teachers get an idea about that via students' body language. Some students listen, think, and learn instantly whereas others need more clarification, and they appear to be perplexed. Hence, there exist many behavioral possibilities of the students, which can only be understood by the teachers precisely when they have face-to-face interaction with their students. Teachers can help the students understand better only when they have clear know-how about their feelings and level of understanding (Guergov and Radwan, 2021; Hamadneh et al., 2021; Hanaysha et al., 2021a, 2021b). Although, through camera faces of students can be seen by the teachers, but due to many possible issues it cannot replace the significance of face-to-face interaction in classrooms. Pre-primary and primary teachers are more likely to face interaction issues during online classes where they are far distant from their little students. Young students demand their teachers to understand them in all the possible ways and that for teachers is possible only when there is barrier-free contact with their students. The college and university teachers also face this issue because in higher studies discussion is extremely important for extended learning. This, in online education, is feasible only in the case of proper planning of courses which is not possible in case of emergency online teaching (Hodges et al., 2020).

2.2.2 Emergency Case: Sudden Shift

The switch from conventional to online teaching was a major one. The lectures and code of conduct are always pre-prepared and that also in consideration with the medium of lecture delivery and learning environment. This all demands a suitable amount of time which was not the scenario post-Covid-19 (Kashif et al., 2021; Khan, 2021). After the shutdown of educational institutions due to the global pandemic, teachers were abruptly asked to play the role of both designers and tutors and that also by using such tools which very few of them had used earlier (Rapanta et al., 2020). Online education is very different from traditional teaching and requires proper training, which did not happen in the concerned case.

2.2.3 Assessing the Performance of Students

In academia, assessment is considered the most vital ingredient to keep track of the performance of the students. Assessing the performance of students is important for determining, examining, and fixing the problems students are facing. Research shows that teachers consider taking assessments of the students necessary due to three main reasons, which include enhancing and facilitating the learning process, preparing learners for the upcoming level, and examining the effectiveness of the

teaching methodology (Schut et al., 2020). It is the prompt way of getting access to the problem areas of individual students so that they could be helped by the teachers in a better way (Rapanta et al., 2020). Assessing the performance of students during online classes is one frustrating task. One thing to be highlighted here is that here we are basically talking about *emergency* online teaching, not about the general one. At the time, the lockdown of Covid-19 happened, the annual year at schools and colleges and the semester at universities were all going-on and shifting instantly from traditional to online was one tough task, which comes under emergency situation. In such scenarios, proper planning and instant re-designing of the courses is impossible Online assessments can be made fruitful but with proper evaluation from the scratch which was not possible in the argued scenario (Hodges et al., 2020; Rapanta et al., 2020).

3 Materials and Methods

This research was carried out qualitatively as well as quantitatively. The idea behind doing so was to reach out to strong justification points regarding the effectiveness of online education in Pakistan after the Covid-19 outbreak caused lockdown to happen across the world.

3.1 Qualitative Method

The related research papers were gathered to argue upon the factors affecting online education which were then related to education in Pakistan in the Covid-19 scenario. This section of qualitative research was divided into two subdomains covering the perspectives of students and parents and the other one dealing with the viewpoints of the teachers. This research paper focuses on the students and teachers of pre-primary to doctorate level. A comparison regarding the difficulties faced and effectiveness amongst various education levels has also been carried out.

3.1.1 Students and Parents Perspectives

When it comes to the viewpoint of students and parents, the following are the four major factors that this paper discusses having a heavy impact on the effectiveness of online education in the post-Covid-19 scenario:

- Learning Environment
- Students' teacher relationship
- Access to online education
- Level of Awareness and Computer Literacy

These four factors are reviewed in a very detailed manner. The social, psychological, financial, as well as cultural; all impacts were covered in this research. The learning environment owns immense importance, when talking about educational potency (Lee and Ahmed, 2021; Mehmood, 2021). Considering this very fact, educational institutions and classrooms are designed in such a manner to facilitate learning for students of all levels. When everything went online all of a sudden after the unprecedented situation of Covid-19, it appeared to be a major challenge to provide students with a healthy learning environment at home. The learning habitat holds a strong impact on the interest levels of the students (AlHamad et al., 2022; Ali et al., 2022; Radwan and Farouk, 2021). Also, Pakistani culture strongly supports a joint family system, which results in the presence of many people at home. All these related points have their psychological, cultural, and environmental considerations which made us review the significance of the learning environment and the problems which were faced by the parents in providing a healthy ambiance for benefiting from online education. The sudden lockdown due to Covid-19 created a barrier between students and their teachers (Lee et al., 2022a, 2022b; K. Lee, Romzi, et al., 2022a, 2022b). This relationship was then entertained by digital devices and the internet. Although it is considered to be one major benefit of technology that students get to attain education even in these difficulties and they are somehow connected to their teachers and trainers but still, the teacher-student relationship has surely been affected (Miller, 2021; Mondol, 2021; Obaid, 2021). Also, this has created an additional responsibility on the parents to cope-up with the semi-absence of the teachers. For acquiring maximum benefits of education, while being online, it is extremely important to have proper access to digital gadgets and the internet. Also, we know that load-shedding is one of the major issues in Pakistan. Also, the difficulties faced by the Pakistani parents in making the availability of these online necessities possible for the education of their children are discussed. The impacts of having a good or bad Internet connection and having or not having digital appliances over the education of the students of various education levels have been discussed. Keeping in mind the Pakistani society and culture, it was crucial to review the impact of the awareness level and computer literacy of parents, when it comes to online education.

3.1.2 Teachers' Perspectives

Section 2.2. of this paper touches three major concerns of the teachers of all education levels.

- Face-to-face interaction with students
- Emergency case: Sudden shift
- Assessing the performance of students

These factors were thought of as being important for the teachers of all education levels. Impact levels might differ as we move on from pre-primary to doctorate level. It is considered necessary for the satisfaction of teachers to know whether the students have understood the delivered concepts or not. One of the methods to het this idea is

by reading the body language of the students (Alshurideh et al., 2012; Alzoubi et al., 2022; Al Kurdi et al., 2020a, 2020b). The significance of the face-to-face interaction of teachers with their students was discussed. Online education somehow existed before the Covid-19 lockdown also, but it was less common and carried out with proper planning. In case of Covid-19, education system had to switch immediately from traditional to online system which surely was not easy for the stakeholders. The difficulties faced by the teachers in the concerned emergency situation and the impact of this sudden major switch on the quality of education had also been reviewed. Conducting various exams at different levels is one important element of education. It was much needed to examine the significance of assessing the performance of students. One major concern of teachers related to emergency online education was to come-up with a way for trying to evaluate the performance of students in the most effectual manner. The qualitative part of the paper basically relates some serious considerations of education system with emergency online education which here is Covid-19.

3.2 Quantitative Method

It was extremely significant to gather the opinions of Pakistani parents and teachers while carrying out the research regarding the effectiveness of online education. For this very purpose, two separate survey forms were prepared to be filled by the parents and teachers, respectively. These survey forms were designed using Google Forms and were digitally sent to the parents and teachers via different social forums.

3.2.1 Parents' Perspectives

The survey form for the parents consisted of sixteen questions, whereas the survey form for the teachers comprised of twenty questions. All the questions of both the questionnaires were kept close-ended to get to-the-point results. While designing the questionnaire to be filled by the parents, the idea was to cover all the points that appeared to have the maximum relevancy at the end of parents and students. The education level and extent of computer literacy of the parents was acquired for the sake of assessing the participation of parents in making the online education of their kids easy and fruitful. The education level of the children was also interrogated so as to examine the differences as well as the reasons of those differences in the effectiveness of online education at different levels of education. Some questions were targeted at the availability of devices and accessibility of internet as these two are considered the basic instruments of online education. Few questions were kept in order to cover the financial aspect of online education as well. Also, the interest level of students and their progress scale after the shift of traditional to online education, as well as their willingness to continue with the online education in future was tried to be examined through the survey.

3.2.2 Teachers' Perspectives

The questions included in the survey form outlined to be filled up by the teachers of different education levels aimed at gathering the practical responses to all the aspects covered in theory. The computer literacy of the teachers was interrogated to examine the level of struggle they had to put for entertaining the education online. Covering the financial and social elements was also important so few questions were kept for that also. Questions regarding the internet connection and digital devices were also incorporated in the questionnaire for teachers also. Moreover, few questions were targeted at the involvement of students during online classes and regarding assessing their performance. We know that each curriculum course is different from the other and hence is subjected to be taught differently, keeping that in mind, a question regarding the subjects taught by the teachers was also asked so that it could be assessed that which subjects were easier to be taught comparative to the others.

4 Results

This section of the paper first discusses the results and findings accumulated after carrying out the qualitative and quantitative research of the perspectives of parents regarding the effectiveness of online education of their children in the post-Covid-19 scenario. Results from both types of research are discussed separately. Further, the comparison of their results is carried out. Same is then done for the results received regarding the effectiveness of online education in the post-covid-19 scenario from the all-important perspectives of the teachers.

4.1 Perspectives of Parents

Qualitative research suggests that in a country like Pakistan, where the use of technology is still not very common the sudden shift of the education mode was not supposed to be easily accepted by the students and parents. Having frequent access of children to technology is still not much found in majority areas of the country. Even the parents do not use it very often in many areas. In such cases, it was difficult to manage acquiring the online education in the emergency situation after the lockdown of Covid-19. Only those parents could help their children in a better way who themselves are well educated and technology users. Also, providing disciplined and fruitful study environment at homes appears to be quite difficult for the Pakistani parents as in majority of the areas of the country, joint family system is very common. The survey conducted to gather the opinions of parents on the effectiveness of online education received 73 responses. The following Fig. 1 shows the education level of the respondents' children, while Fig. 2 shows education level of parents. Figure 3 depicts the uses of digital devices by parents.

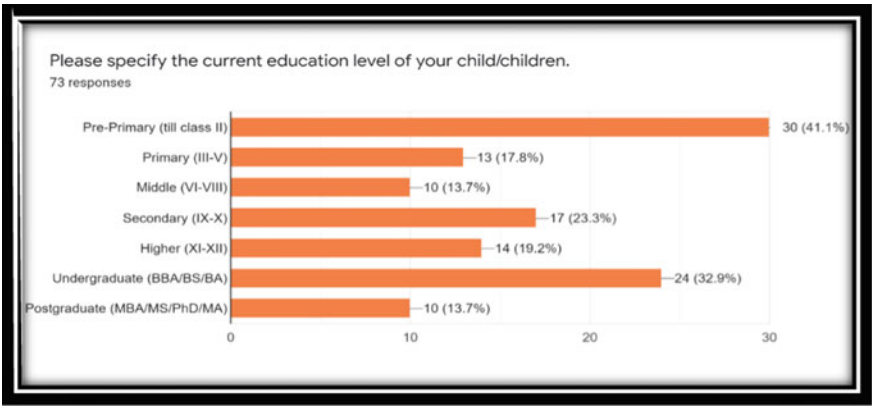

Fig. 1 Education level of students

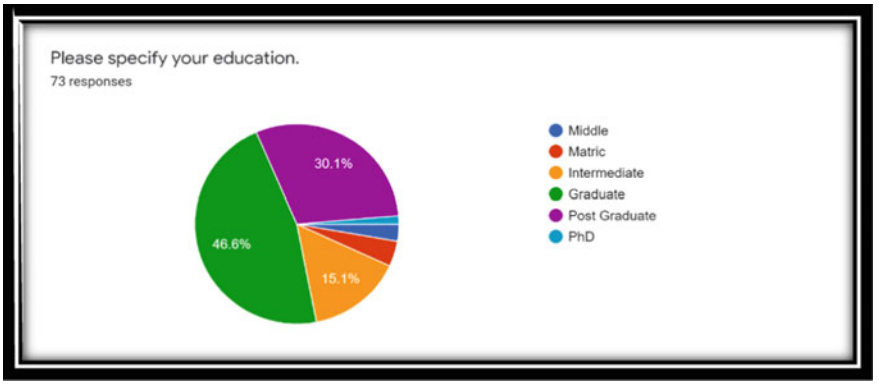

Fig. 2 Education level of parents

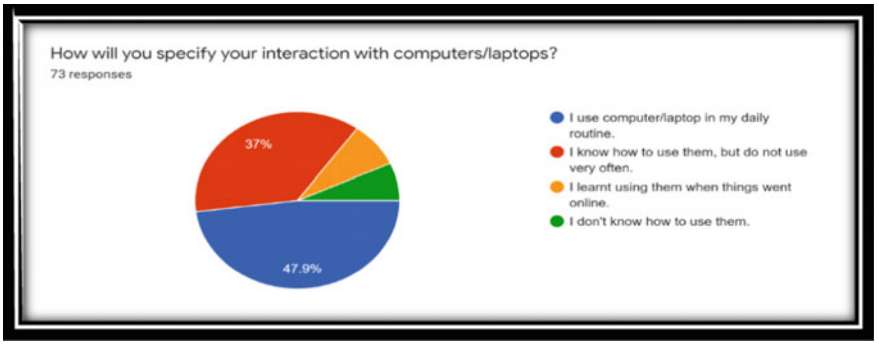

Fig. 3 Usage of digital devices by the parents

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The conducted surveys showed that the parents of the students acquiring the online education are educated enough to have helped their children in getting access to the online education in the best possible way. The Figs. 2 and 3 as shown above depict that 46.6% of the parents are graduated and 47.9% use digital devices in their daily routine. This shows that parents who are well educated and prompt at using the technology can help their students in getting smooth access to online education. Figure 4 shown above suggests that only 39.7% parents had to buy the digital devices for entertaining the online education of their kids. Rest of them already had the resources. Further, Fig. 5 clarifies that even out of those 39.7% parents, 60.3% had to buy only a single device. Figure 6 shows that more than 60% of the parents were sure about not having any sort of increased financial burden caused due to online education. These results suggest that there was not much of the increased financial burden on the majority of the parents after the switch of traditional to emergency online learning.

The Fig. 7 suggests that the dis-connectivity issues were faced by majority of students, but not most often. So, these results suggest the situation which can be negotiated well. Figure 8 shows that majority of the children followed proper table-chair discipline at homes during their online classes, which suggests the increase in the probability of the effectiveness of online education. The Figs. 9 and 10 propose that the interest levels of the children, while taking their online classes were not good

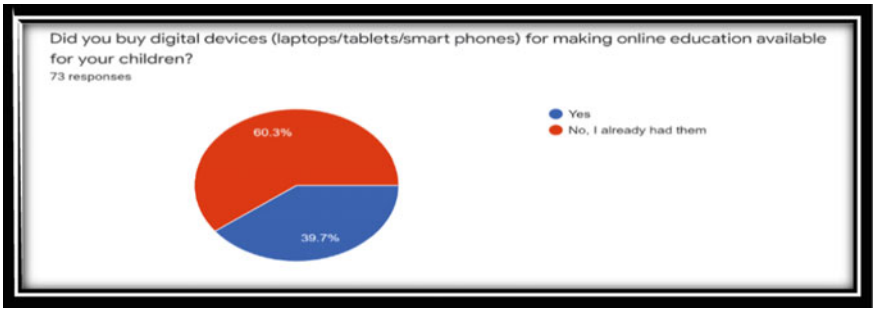

Fig. 4 Parents who had to buy the digital devices for the purpose of online education of their kids

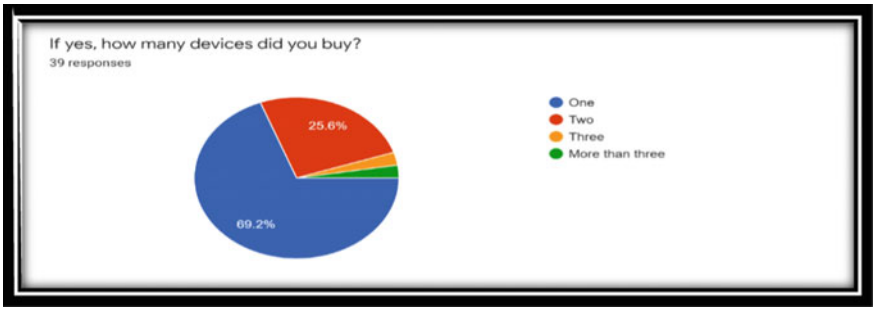

Fig. 5 Number of digital devices purchased by parents to facilitate online education of their kids

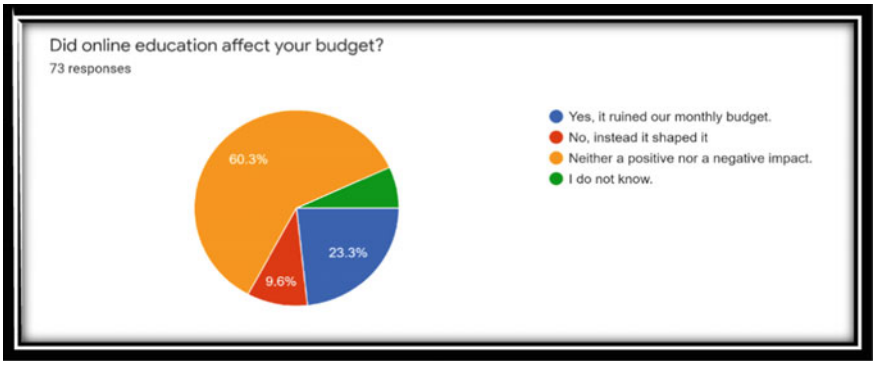

Fig. 6 Effect of online education on the budget

enough. For the fruitfulness of education and better performance of the students, it is extremely significant in the process of effective education.

Figure 11 shows that some serious issues had their impact on the effectiveness of online education. Communication of students with their teachers and motivating the students to take online classes seriously, have been found difficult to be managed. Load shedding issue had also been a major concern because without the stable supply of electricity, anything online won't be considered much smooth and influential. As depicted by Fig. 12, it can clearly be found that majority of the parents in Pakistan does not want education to stay online in the future. This implies that even if the parents are satisfied with the current procedure, they have to struggle and keep tolerant to make online education go on smoothly for their children. Traditional approach appears to get a warm welcome by the students and their parents once this epidemic end, and everything goes back to normal.

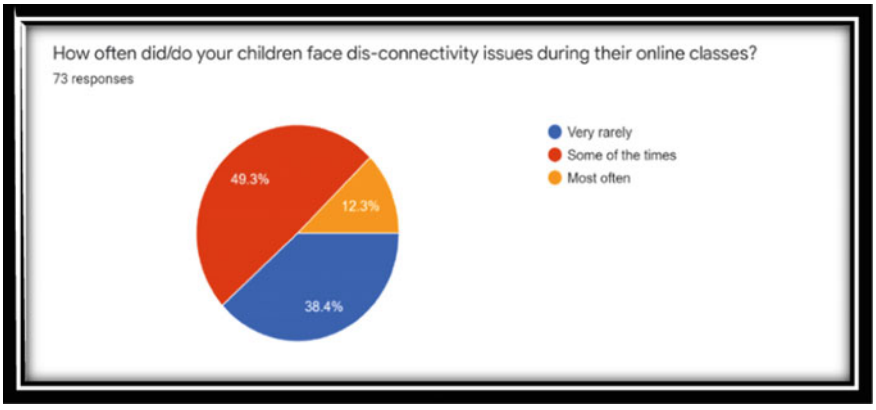

Fig. 7 Dis-connectivity issues faced by the students

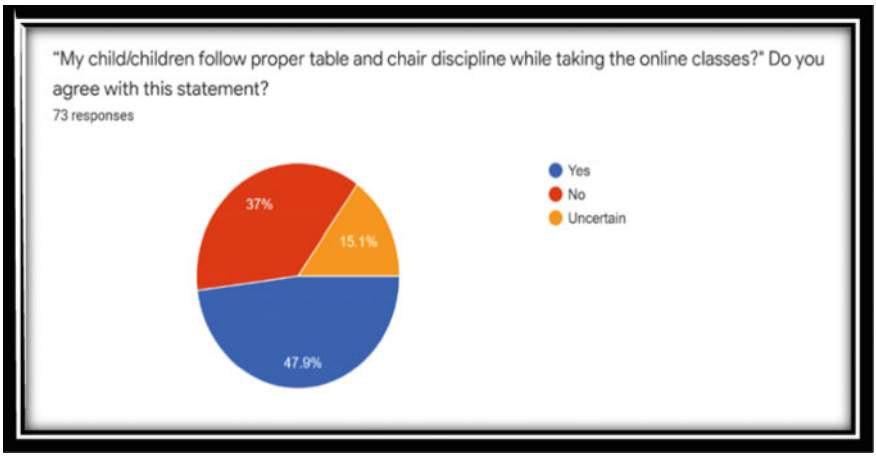

Fig. 8 Children were disciplined while taking online classes

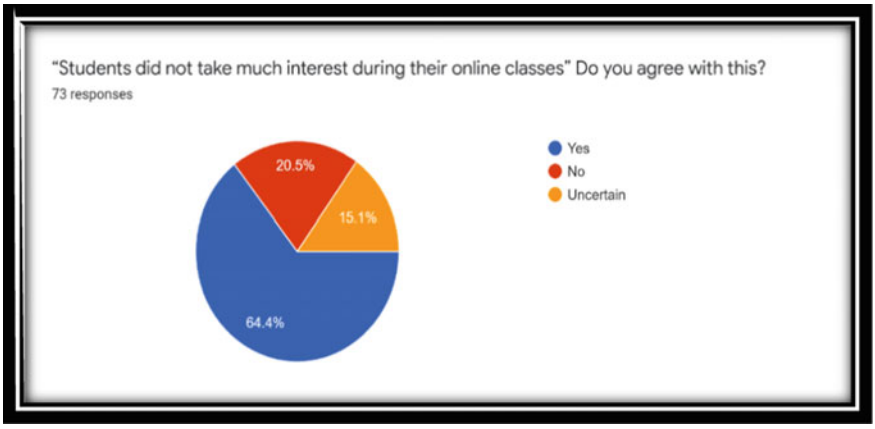

Fig. 9 Students were not interested during the online classes

Both, qualitative as well as the quantitative research suggests that online education is fruitful, where there the resources are properly managed, a disciplined learning environment is maintained, and parents are well educated and IT literate. In comparison to qualitative research, which suggests many difficulties with respect to the financial and educational backgrounds of the parents and the cultural values being followed in the country, to be faced by the Pakistani parents, quantitative results are very much normalized. Also, it has been found that the parents of pre-primary and primary classes have faced more difficulties in comparison to those faced by the parents of children enrolled in higher education levels.

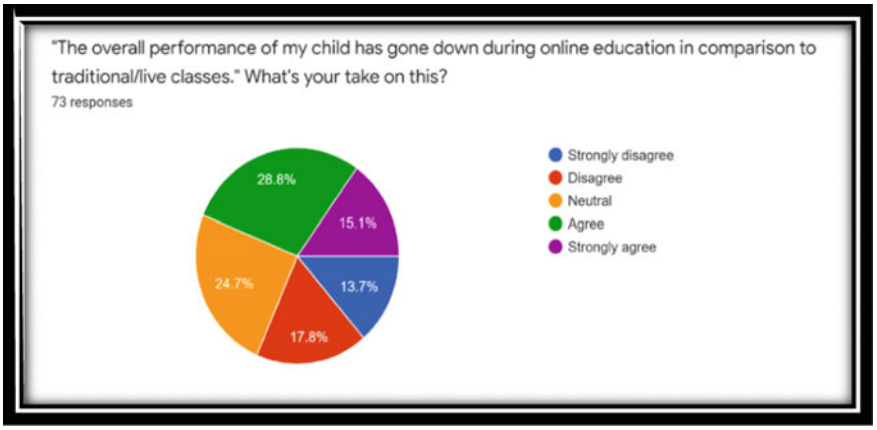

Fig. 10 Performance of students have gone down during online classes

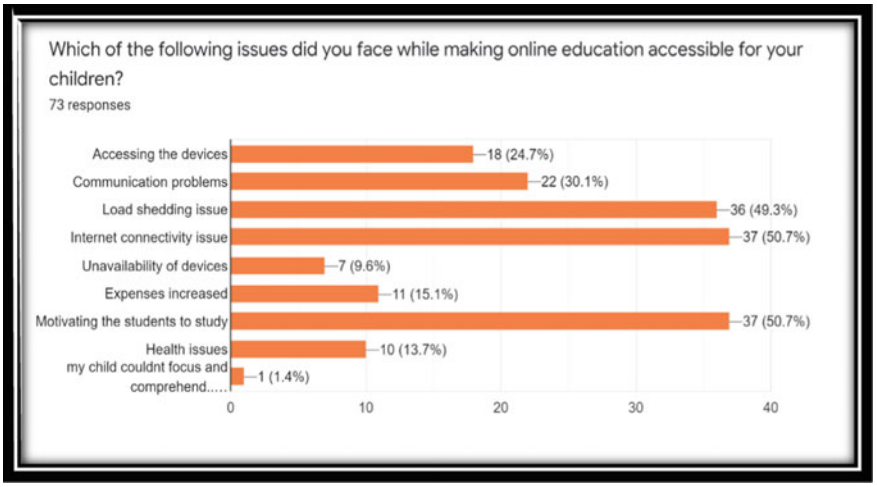

Fig. 11 Issues faced during online classes

4.2 Perspectives of Teachers

The qualitative part of the perspectives of the teachers suggests that since the switch of traditional education to online education after Covid-19 was an emergency case, teachers did not get the required amount of time to do proper planning regarding the conduction of online classes. Due to this, the courses could not get delivered in a much effective manner. Teacher satisfaction levels were found to be much affected as they could not connect to the students in a way they normally used to do during the online classes (Aburayya et al., 2020; Alshurideh et al., 2022). The issues regarding

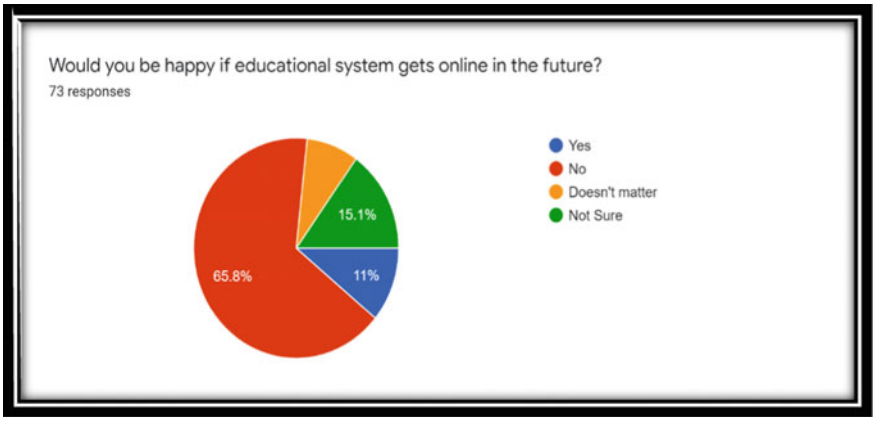

Fig. 12 Willingness of parents for the continuation of online classes

the accessibility of the devices have also been there which had found to put a good amount of impact on the motivation level of the teachers also. The survey conducted to gather the opinions of teachers on the effectiveness of online education received 60 responses. The following Fig. 13 shows the education levels to which the respondent teachers teach, and Fig. 14 shows the subjects taught by those teachers.

The results as shown in Fig. 15 depicts that more than 75% of the Pakistani teachers were familiar with the use of computers before the global epidemic caused the shut-down to take place. This is quite a good percentage which shows that accessing the devices was not a big issue for majority of the teachers. Figure 16 shows that

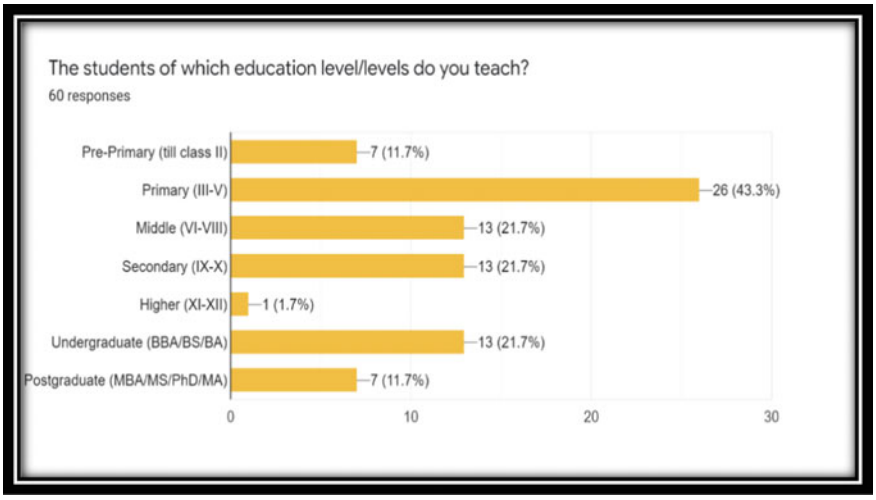

Fig. 13 Teachers teaching different education levels

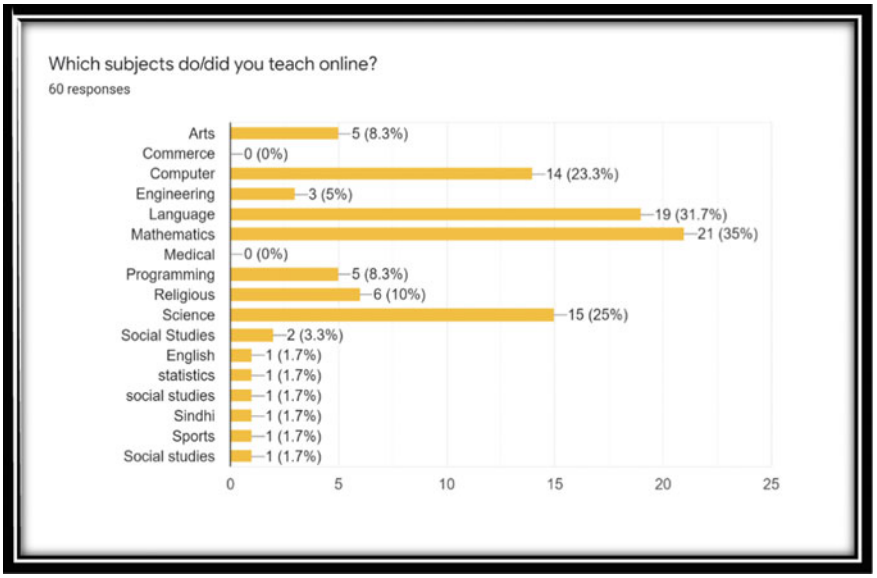

Fig. 14 Subjects taught by the respondent teachers

only 31.7 teachers had to buy digital equipment for conducting online classes. As presented in Fig. 17, out of these 31.7 teachers 83.3% declared that they did not receive any sort of financial support in buying the devices from their employers. This might have caused some disturbance in the budget management for such teachers.

The Figs. 18 and 19 shows that tolerating Internet dis-connectivity was one major issue amongst the teachers of Pakistan. Half of the respondent teachers said that it is easy to deliver the concepts online. After examining the individual responses, it

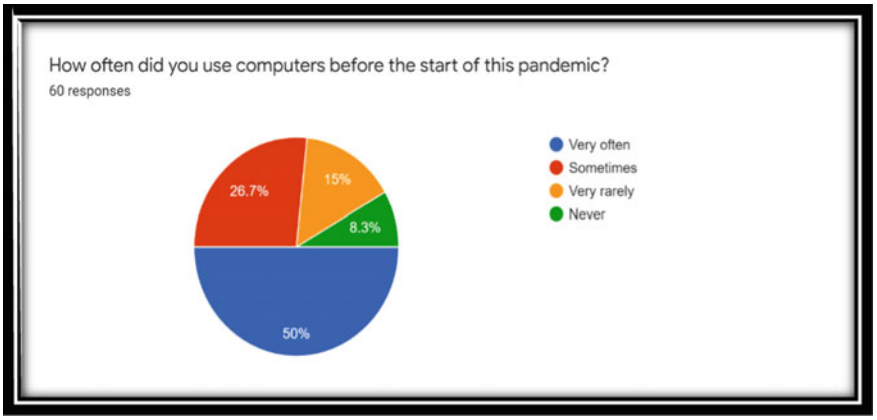

Fig. 15 Fluency of teachers' usage of technology

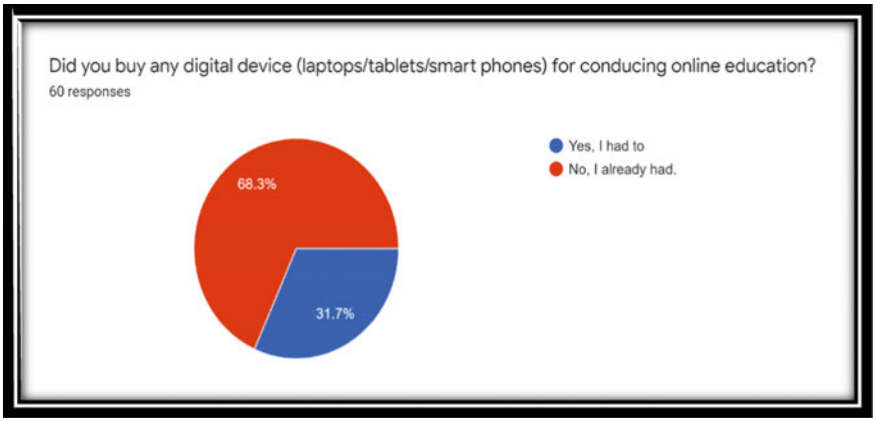

Fig. 16 Non-availability of devices for teachers

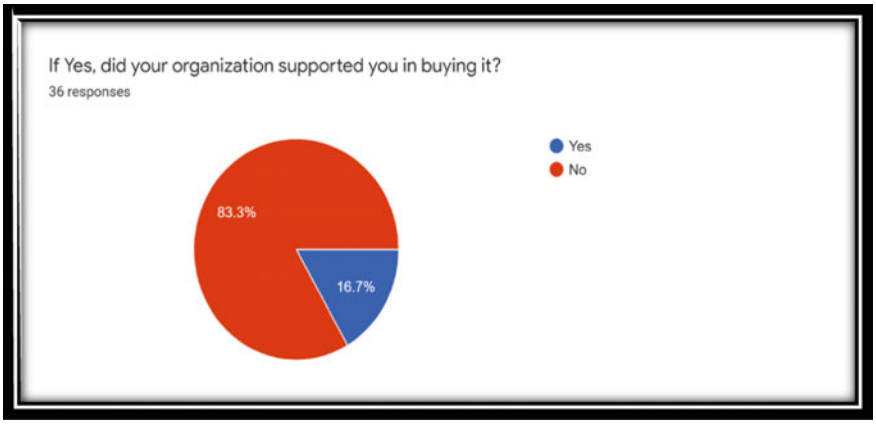

Fig. 17 Organizations' support in making the digital devices available for the teachers

was concluded that this varies from subject to subject. Language, theoretical, and computer related subjects were declared easy to be carried out whereas most of the mathematical teachers suggested that delivering the concepts is not easy. As shown in Fig. 20, 41.7% of the respondent teachers does not feel satisfied after conducting their online classes. Teaching is that profession in which inner satisfaction of a teacher says a lot about the quality of educational process that is going on.

The results shown in the Figs. 21, 22, and 23 suggest that majority of the teachers does not feel much calm at conducting the online classes as they miss the physical appearance and active participation of students.

The results of Fig. 24 clearly show that the Pakistani teachers have found it extremely difficult to scrutinize the progress and performance of students. Figure 25 declares many issues, which were found to be faced by most of the Pakistani teachers.

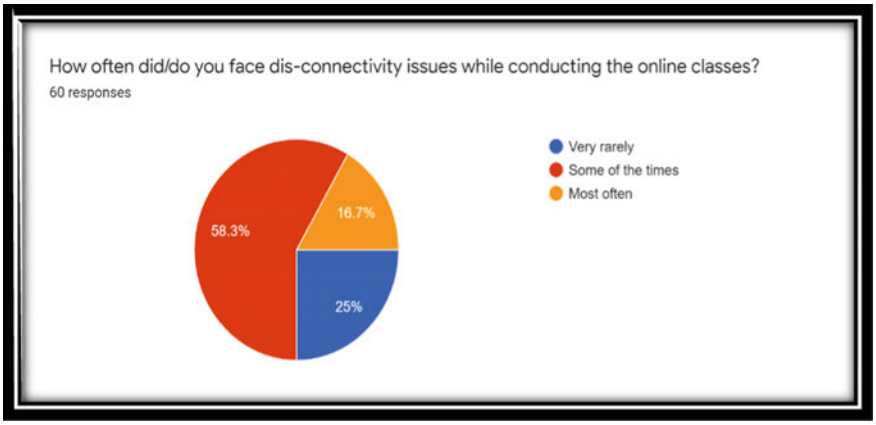

Fig. 18 Dis-connectivity issues faced by the teachers

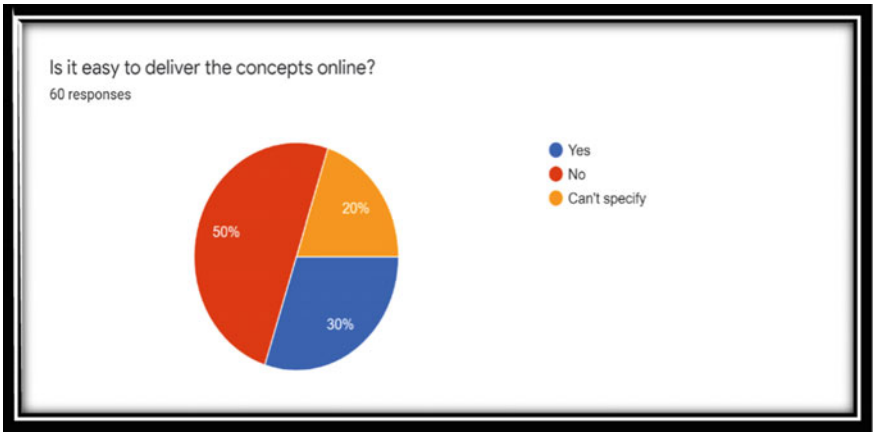

Fig. 19 Delivering the concepts online

Accessing the technology by teachers as well as the students, communicating effectively with the students, increased workload, and time management have been the common issues addressed by the majority of the respondent teachers.

48.3% of the Pakistani teachers are against the continuation of online education in future, depicted in Fig. 26. This shows that they do not find online education much effective to be adopted as a tradition in the future.

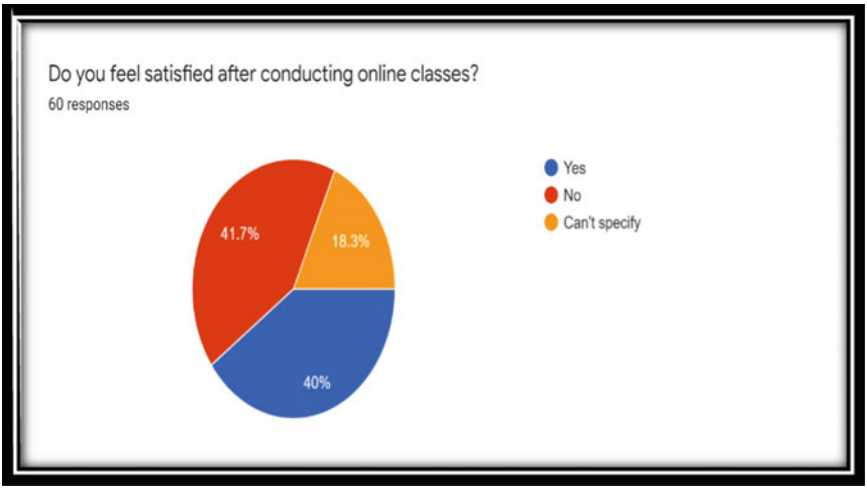

Fig. 20 Satisfaction of teachers after conducting online classes

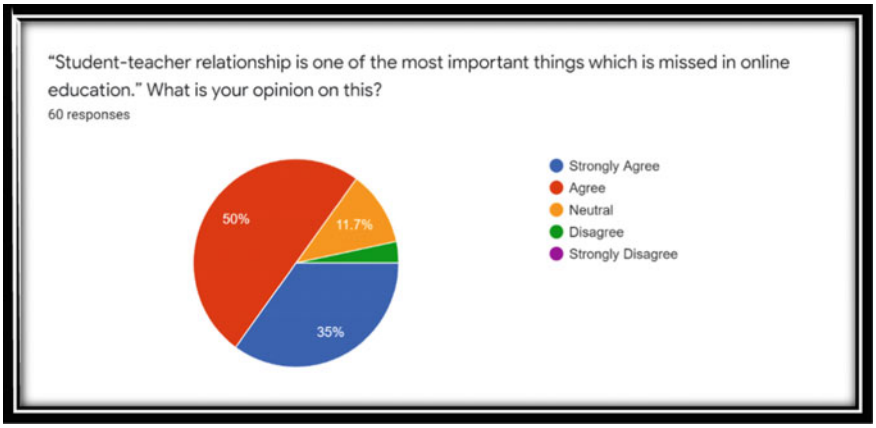

Fig. 21 Student–teacher relationship in online education

5 Discussion and Future Work

The results of the qualitative and quantitative research carried out on the effectiveness of online education suggests that online education could be extremely effective and beneficial if planned properly which was not the case post Covid-19. Although the issues discussed in the literature review were not found much problematic in the quantitative results, but still there are many people who could not get proper access to education after it went online. The level of effectiveness of online education appears to be varying in many ways. Students of higher education levels found accessing

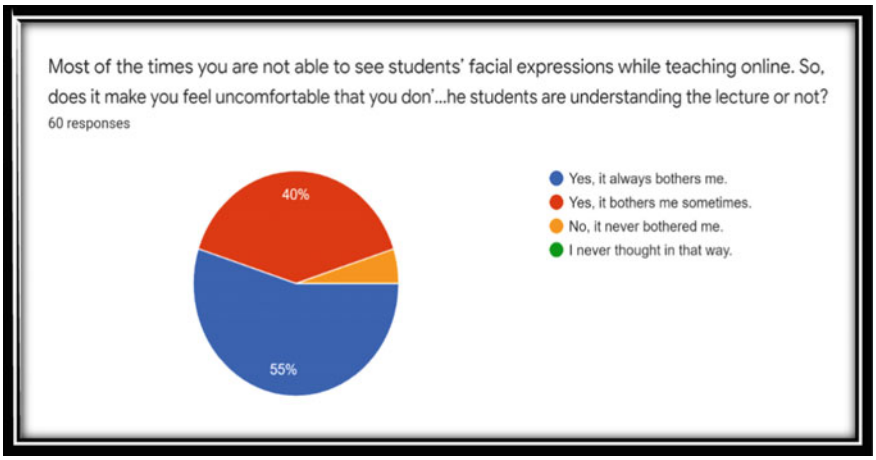

Fig. 22 Participation of students during online classes

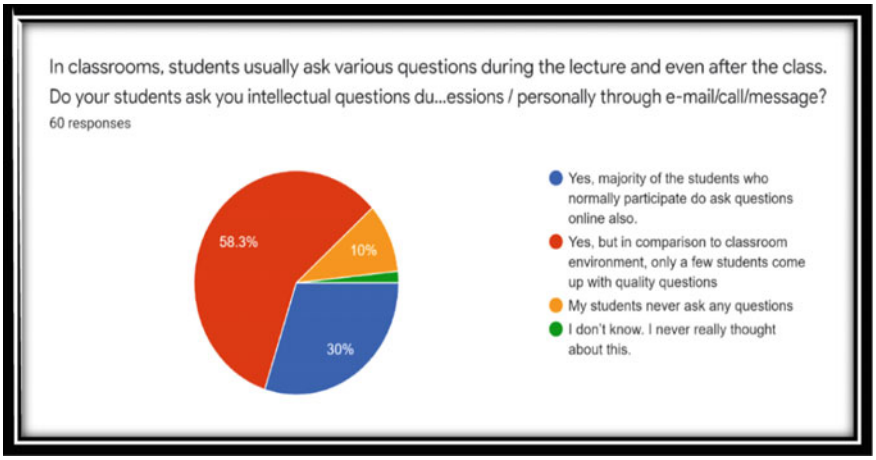

Fig. 23 Engagement of students during online classes

the technology and managing the related issues in a better way in comparison to that of the school level students. Parents owning different educational and financial backgrounds had to face distinguished issues and at diversified extents. Similarly, some teachers were able to connect in a way better than the others. This research paper discussed online education only from the viewpoint of parents and teachers. In future, researchers must cater the opinions of the owners and management of educational institutions.

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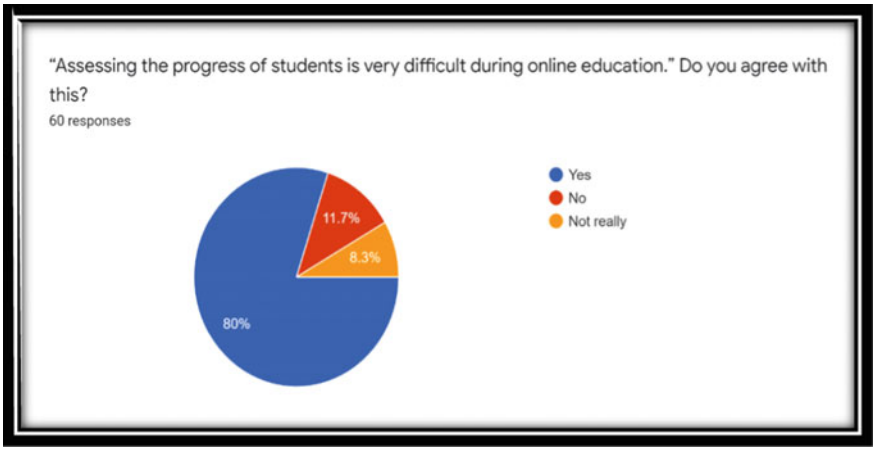

Fig. 24 Assessing the progress of students

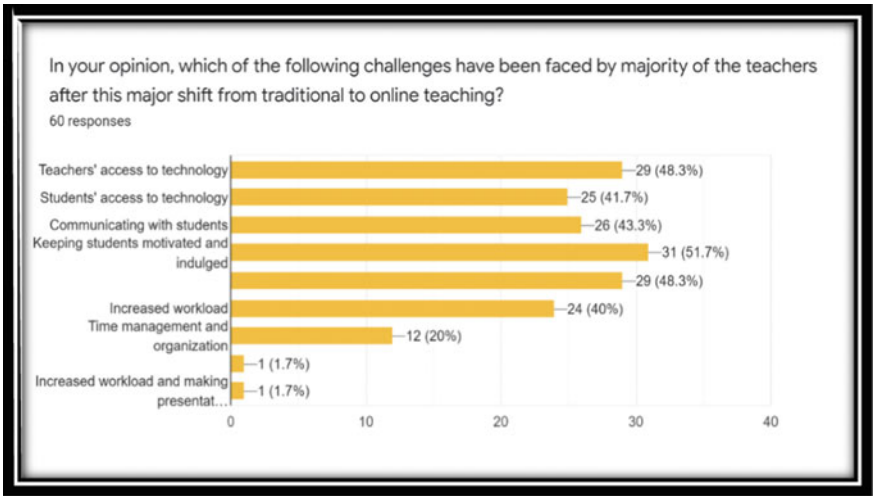

Fig. 25 Major problems encountered during online education in the opinion of Pakistani teachers

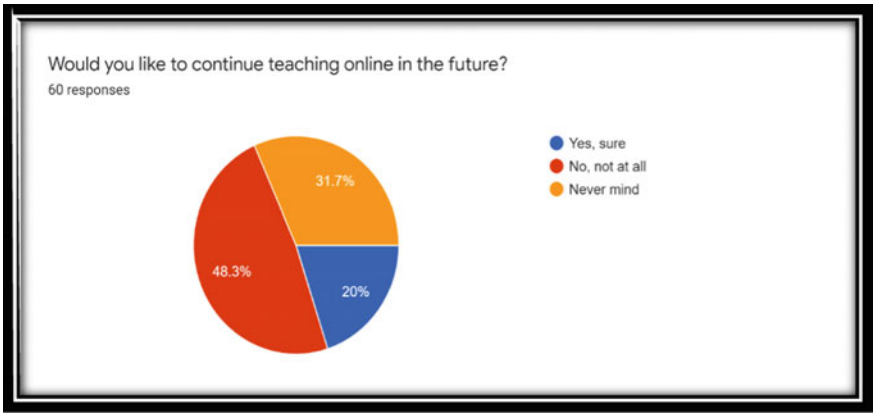

Fig. 26 Willingness of teachers to continue conducting the online classes

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The Role of Distance Learning Technology in Mitigating Unknown-Unknown Risks: Case of Covid-19

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Abstract With the changing circumstances across the world due to the pandemic COVID-19, the concept of distance learning and the use of technology has increased at a very fast pace. This has resulted different online classes and different associated risks related to security with these online classes for the organizations. However, with the passage of time, it has been realized that COVID-19 has now become a part of our lives, and what we considered a matter of days or weeks might last for a very long period, which is still unknown to us. Most importantly, this new phase of life has become a new normal for the people today. It has now become important for us to change the course of our lives and to hold different activities according to this new normal. Most of the business activities are also now being adapted through this social distancing and many other activities involving the education system to be on top of everything else. The methodology adopted for the study was qualitative study and the method adopted for the study was interviewed and generating the study through literature reviews.

Keywords Distance learning technology · Unknown risks · Risk mitigation · Project risk management · Covid-19

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_29

1 Introduction

Today with the development of the internet and especially with the emergence of COVID-19, people have now started taking online courses and have started the distance learning (Akour et al., 2021; Alshurideh et al., 2021a, 2021b). People are now more divulging in the distance learning (Amarneh et al., 2021; Leo et al., 2021). Distance learning defined as a type of learning which allows the delivery of education through the exchange of resources over the communication network (Jiang and Ryan, 2020). Nowadays, people are focused on using the web-based technologies to help the learners and the instructors to interact with each other more effectively (AlHamad et al., 2022; Alzoubi et al., 2022; Lee et al., 2022a, 2022b). Different web-based technologies and social networking sites have inspired the learners to continue with their education, even with this ongoing pandemic (Barween Al Alshurideh et al., 2019a, 2019b; Al Kurdi et al., 2020, 2020b). Most recently with the recent pandemic, several online courses are offered to students (Alshurideh et al., 2020a, 2020b, 2020c; Al Kurdi et al., 2020, 2020b). Therefore, the number of institutes has gained the attention of the students offering higher education. Distance learning have adopted online platforms to provide effective online learning (Alshurideh et al., 2020a, 2020b, 2020c). Though, the concept of security holds a great importance. The process of online learning involves some threats, hacking or attacks which need to be tackled (Al-Maroof et al., 2021a, 2021b, 2021c; Alshurideh et al., 2021a, 2021b). The institutes provide services with awareness of the unauthorized modification, destructions or harm to other educational assets available online (Al Kurdi et al., 2021; Al-Maroof et al., 2021a, 2021b, 2021c). It's essential to the concern of the online learning activities and to consider the inherent security risks on the internet (Bettayeb et al., 2020; Nuseir et al., 2021a, 2021b). Some of the important risks involve identity theft, impersonating or inadequate authentication (Al-Hamad et al., 2021; Alsharari and Alshurideh, 2021). Online learning systems are under the attention of the cyber criminals who often hack into these systems or harm the purpose of the learning process for different means (Alhashmi et al., 2020; Salloum et al., 2020). The businesses and the education sectors are mostly concerned and aware of the potential risks involved and often design dynamic and highly regulated means to fight against these risks. Nevertheless, with the advent of the technology, level of threats and the potential of the risks is increasing. A concept of knowing known and the unknown unknowns have also been introduced. The unknown unknown risks are an organization unawareness of certain kinds of risks existence. Unawareness of the risks may occur new challenging and management difficulties for an organization.

As the COVID-19 brought advanced ways to overcome the risks and continue with social distancing and the online forums or platforms that are being used with new and creative ideas in distance learning (Ahmad et al., 2021; Nuseir et al., 2021; Taryam et al., 2020). Thus, the use of the new modes of learning, increased the risk of unknown unknowns as this is an unexplored territory for everyone.

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This report would identify the importance of such risks and their importance in the education system and would also identify whether the education sector is prepared to fight against these risks or mitigate these risks efficiently.

2 Literature Review

According to Liu, distance learning can be described as a learning process, where both the tutor and students are separated by geographical location and time (Liu & (Lu), 2008). In a nutshell, distance learning is a type of study program, where learning is delivered entirely off-campus. Before the advent of the Internet, distance learning is delivered through two approaches to distance learning, which can either be combined or used separately (Ali et al., 2022; Alshurideh et al., 2022; Lee et al., 2022a, 2022b). The first approach is the paper-reliant approach. In this approach, the student receives a package of learning materials via mail or postal service, completes everything necessary in the package, returns whatever needs to be submitted through mail or postal service, and then receives feedback. The second approach is the audio-visual approach, where television programmes and instructional videos are used. In this approach, distance learning students view a pre-recorded lecture, complete the necessary tasks, returns the task through mail or postal service, and then receive feedback (Nazir et al., 2021; Totaro et al., 2005). Most times, the audio-visual approach is enhanced with visual aids and documentary style materials. Nowadays, distance learning is being delivered via online course materials, using social network platforms, emails, and websites as support (Alzoubi, 2021a).

Lake noted that the advent of distance learning technology has enabled distance learning to be delivered in new ways without much constraints (Lake, 1999; Sultan et al., 2021). He said, "technological change has enabled the materials of education to be dispersed economically in new ways with fewer temporal and spatial constraints." With the distance learning technology, there is no longer need for students to attend regular lectures delivered in brick-and-mortar lecture rooms or theatres at a predetermined location and time. Students receive lectures in a different learning environment – online class (Alhamad et al., 2021; Ashal et al., 2021; Kelly, 2020).

Almost all the Universities and institutions of learning have embraced the relatively new distance learning technology not only for its potential for increasing the number of students without the need to accommodate them in a physical lecture hall/theatre but also for the safety and convenience it holds, especially in this period of Covid-19 pandemic (Akhtar et al., 2021; Kashif et al., 2021). Currently, distance learning has become an increasingly popular way of delivering higher education in higher education establishments (Baber, 2020).

According to Liu, the term "distance learning" is simply education delivered at a distance (Liu and (Lu), 2008). It is also referred to as "distance education," "on-line learning," and "e-learning." Some literatures have taken distance learning to incorporate online-based education programmes with face-to-face contact sessions (Al Ali,

2021; Muhammad Alshurideh et al., 2019a, 2019b). However, such incorporated programmes are mostly referred to as "blended learning" programmes and is beyond the scope of this paper (AlHamad and AlHammadi, 2018). This study focuses mainly on distance learning as a learning process where the learning courses and materials are remotely delivered to students from the university or hired e-learning facility, and lecturers and students do not need face-to face encounter (AlHamad and Al Qawasmi, 2014; Al-Mashaqbeh and Al Hamad, 2010).

2.1 Distance Learning in Higher Education

The COVID-19 pandemic caused several institutions of learning to shut down temporarily, though some have resumed physical classes, some are still temporarily closed. Hence, face-to-face learning has halt in several schools, colleges, and universities. This will subsequently have negative impacts on learning activities if nothing is done. As a result, most institutions of learning are trying alternatives ways of managing this difficult circumstance to prevent interruption to education (Dhawan, 2020; Otair and Hamad, 2005). This stimulated the growth of distance learning and many schools, colleges, and universities have been trying out how best to offer distance learning (Al-Maroof et al., 2021a, 2021b, 2021c; Mukhtar et al., 2020).

It is also expected that the Covid-19 pandemic would make the new distance learning technology adopted by institution that were previously resistant to accept the method. Before the Covid-19 pandemic, distance learning was underutilized, especially in developing countries. However, the on-going crisis of the COVID-19 pandemic has enforced almost all the nations of the entire world to rely on distance learning for education (Eli, 2021).

Distance learning, also referred to as e-learning or online e-learning, is described as a learning process using several different electronic devices with internet availability or data connectivity in synchronous or asynchronous environmental conditions. These devices include computers, laptops, smart devices, and so on. Distance learning could be a platform that will make the education process more student-centred, flexible, and creative (Singh and Thurman, 2019). It is easily accessible and cost-effective, especially when the receiving students are far away, in rural, or in remote areas (AlHamad et al., 2014; Dhawan, 2020). Distance learning technology brought tools to implement several creative strategies to combat unknown risks and deliver online courses. These tools include various software applications like Zoom, TeamViewer, Google Classroom, Microsoft Teams, and so on.

It is expected that the implementation of distance learning technology should not only transform education process from the traditional teacher-centric method to student-centric model but also help in mitigating unknown risks (Alsharari, 2021; Mehmood, 2021; Miller, 2021). If this true, then distance learning technology can be accepted as an education tool within institution of learning that if implemented would help in future endeavours during pandemic, and even in non-pandemic situations, to smoothen learning process.

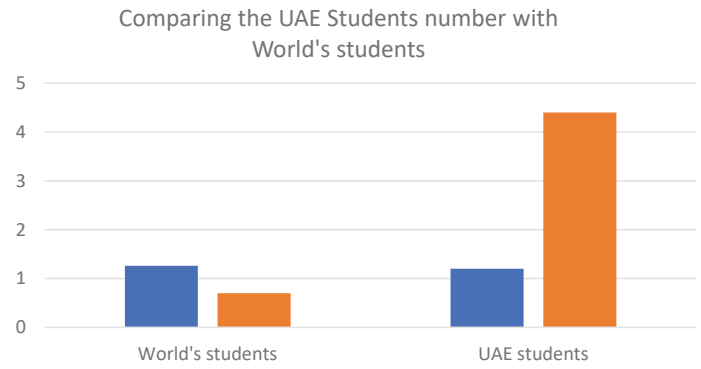
2.2 *Implementation of Distance Learning Technology in Mitigating Risk*

Today the technology plays a very important part in introducing the world to new and more advanced ways of performing different types of activities especially in the new crisis of COVID-19 virus (Alameeri et al., 2021; Obaid, 2021). First, this disease was a newfound threat, which was unheard of before, and all of the people were not aware about the dangers of it. It was not expected that it will last for this long. Through this crisis nearly everyone from all around the world were affected. Therefore, the most successful organizations were the one who was having a better methodology to deal with the known and unknown risk (Wetsman, 2020).

Distance learning is one of the most important fields in the education which focuses on the teaching methods and technology in order to deliver information and teaching. This type of teaching is when the students are not physically present in a classroom (Bušelić, 2017). In other words, distance learning defined as instructional learning which force the time/geographic situation to have no contact between the student and instructor or teacher (AlHamad, 2020; King et al., 2001). Distance learning offers a huge number of advantages which might be evaluated according to technical, social and economic standards (Aziz and Aftab, 2021; Radwan and Farouk, 2021). Therefore, it supports the quality and diversity of the educational structures, to improve and support capacity and ability (Bušelić, 2017). Moreover, this learning method helps the organization to save money and time and both learner and educator can use it wherever they want (Bijeesh, 2017). On the other hand, there are lots of issues or disadvantage for this type of learning just like it is unlike the traditional learning because there isn't immediate feedback for the learner through it (Alzoubi, 2021b; Farouk, 2021). Moreover, oral communication skills don't have the opportunity to appear in the distance learning and the learner will not have the chance to use verbal interaction between each other (Bušelić, 2017).

Based on the information that Kim (2017) mentioned in his research that unidentified risk or event are the one which is not identified because there wasn't any access to the knowledge or information about it. Some of them are unexpected or not imagined because there not enough information about it. In other words, the unknown risk shown as a cause of some events than cannot be determined or to identify their factors. As an example of that the political events and some types of liquidity risks that hard to be measured properly (Anon, 2020). One of the main unknown risks that all the world is facing in these days is COVID-19 risk and to manage the known and unknown risks, the risk professionals have to change their priorities and work habits to have the best way to deal with this "new normal. From the beginning of March this year, all educational institutions from all around the world and UAE had closed, sent all the students' home, and moved for online learning. Therefore, all the educational institution plan to manage all the risk issues that COVID-19 cause of the learning through few basic steps such as, risk assessment triage by ordering which risk categories will need reassessment first, and which risk can wait (Cruz, 2021). Then to monitor and repeat which means to monitor the risks case, analyse

the available data, and re-evaluate everything again, as required. COVID-19 keeps people apart, so the technology and the distance learning give the chance for the people now to work remotely by provides easy-to-use communication tools.



As an example of the importance that distance learning mitigating this crisis that some countries like French have reopened the schools after the lockdowns very fast and that cause to have flare-up of about 70 COVID-19 cases between students or teachers after one week only (Cole, 2020). This case explains about how importance to deal with this crisis by using learning distance to continue the academic year. According to the H.E. Al Hammadi the UAE had adopted the necessary actions to complete the academic year through using a smart learning system for almost 1.2 million students from the UAE's schools and universities. While there are 70% of the world's students around 1.26 billion who are facing a lot of difficulties of completing their academic year in 2020 because of Covid-19 (Masoud and Bohra, 2020).

The educator and educational institutions need to consider some principles during using the distance learning through this crisis COVID-19 just like to set new and different learning goals and process which fit the new situation, design the distance learning activities based on the online environment (Alameeri et al., 2021; Guergov and Radwan, 2021). Also, to be prepared very well to deal with all the challenges that will face the learner (Folsom, 2020). One more important thing is to keep these main three requirements in the online learning which are confident of both the learners and educators, integrity for both and to ensure the easy availability of both ends.

Confidentiality would ensure to include and protect the sensitive private information for both educators and learners of being accessed by any unauthorized person and to make sure that no such information is disclosed to any unauthorized person (Khan, 2021; Lee and Ahmed, 2021; Mondol, 2021). It is required to design a login system with a strong delimitation to safeguard the registered users and to protect them. The organizations develop different resources to ensure the confidentiality of the data and to protect and provide the data completely. Availability would ensure that access of the information should be easily granted to the authorized users whenever required.

3 Research Methods

Selecting the right research method is extremely vital for any research study. The research method selected for this study is qualitative method. This chapter is focused mainly on implementing the learning objectives which would help in evaluating the role of information technology and how it can help in influencing the distance learning and eventually mitigate the possible risks associated with the distance learning.

This method is more based upon the factual data and collection of information rather than collecting the numerical data. The data collection methods adopted in this study would be to gather information from different authentic literature available and also to collect the information through collecting interviews from five different organization as follows: a Marketing Communication Manager in the Anglican Church Grammar School (Churchie)—Education House Finland, a Head of Academic Affairs of Alqalaa Primary School, a Principal of Um Ammar Kindergarten School, an Engineer from Mohammed Bin Rashid Space Centre, and a Technical Support Technician from Abu Dhabi Technical and Vocational Education and Training Centre (ACTVET). Both these means of collecting information would help in generating a more in depth understanding and explores more elaborate data for the study which is very important for distance learners.

The study would be focused on the descriptive and the evaluative approach where the variables of the study would be measured through the qualitative research. The data collected is non-numerical in nature which is suitable according to the nature of the study. The study design followed in the research is not experimental in nature suggesting that the variables in the study cannot be altered, instead they have to be observed more efficiently through the framework designed through the usual framework for the study.

The data observed in the study would be more descriptive in nature and would be collected in a systematic manner. This section of the report would be more focused on selection of the right research articles or the literature for the study and also to effectively generate the interviews for the study. Moreover, these sources selected for collecting the data would be secondary sources.

The research has focused on investigating the meaning, attributes and interactions of the right methods from different research phenomenon. The qualitative approach adopted has helped in collecting the evidence supporting whether the technology plays an important role in the process of distance learning, especially in facilitating the users under the present circumstances of COVID-19 (Al Khasawneh et al., 2021a, 2021b). The research will highlight how these strategies can be modified in order to sustain the provision of education for a longer period of time in relevance to the changing circumstances across the world.

Interviews were conducted online with the staff members. An interview was formulated with 20 questions, where the staff members were asked about the use of technology, how they consider that the distance learning can be an effective way of learning for the students. Also would be focused on how the organization can use its different strengths in overcoming the weaknesses of the organization or schools.

The interviewees were also asked to provide their recommendations regarding the distance learning and the risks associated. In addition, the interview questions were focusing on different potential risks involved associated with the usage of technology in implementing the distance learning.

4 Results

Based upon the literature generated from the literature review and the interview, the interviewees mentioned that the most significant risks associated with the distance learning or other online activities especially when the technology is involved included the Brute Force attack, MIMT attach, Cross site request, IP Spoofing, Masquerade, Session Hijacking, Session Prediction etc. the interviewees suggested that the most widely used protection measures included installing the firewalls, implementing the security management systems, improving the authenticity and accountability of the online sessions more effective and also ensuring the digital management and training professionals to be hired for the users to help them getting accustomed with the online sessions.

The interviews' outcomes show that it is extremely important to develop the understanding of the challenges faced especially in terms of unknown unknowns. With the global pandemic COVID-19, the education sector is facing number of issues where the technologies have made it even more important to prepare the schools and organizations against the unknown risks. Technology has significantly advanced over the period of time, although has now become a common practice to find technologically advanced solutions and to the pay high cost of the information and communication infrastructure.

The findings indicate that it is extremely important to understand the root cause of the issues arising. Although most of the issues might seem to be large and unsolvable, but it is important to investigate their root cause and to determine the productive results for these unknown unknowns to find the solutions. It is the responsibility of the management in every educational organization to communicate the risks involved, especially when the risk becomes a reality. It is important to provide all the stakeholders, especially the students with the suitable solutions to move forward and determine the right solutions. It is also important to keep a regular check on the communication plan and to keep an update on the progress.

The results can be more effectively presented in the diagram below. In the diagram the larger circles would represent the basic concepts and they are joined with each other in the form of the clusters and the dots. It has also been identified that the basic concept behind this learning process is that this helped the students in being able to learn more effectively and get acquainted according to the concept of online courses and the environment more effectively. This also helped the students and the educators to make use of the technology in the best possible way and help them with supporting and developing the access to the online learning mediums more effective.

The interviews have identified that it is extremely important to get a grasp of the unknown unknowns at the root and develop the technology skills and competencies to deal with the hitches involved. It is important for all the members involved to be effectively involved in the process of improving their skills and experience within upstream and downstream in being able to mitigate the possible risks.

While the interviewees also highlighted that there were number of risks involved which included protecting the online class sessions and also to ensure the confidentiality, integrity and the accessibility to be maintained for all the users involved through the effective means of communication.

5 Discussion of Results

Distance learning is the new trend that most of the educational organizations are aiming to adopt it. But some of the organizations are still working on that where the needed technologies are not in their scope. As the technology plays a big role in the success process of the distance learning.

The major patterns we have observed are that the risk management tool which needs to be raised as it fell short in the identification of risk on time. As discussed through the interviews, the organization's strategy considered highly during the current pandemic where it reflects on the way organization dealing with the pandemic. So, there are certain mechanisms that organizations must consider the unknown risks in their strategy such as planning for risk management, and analysis the quantitative and qualitative data. These mechanisms must provide alternative solutions, and adopt the latest tools/technologies as a lesson learnt from the COVID-19 pandemic (Hanaysha et al., 2021a, 2021b; Harahsheh et al., 2021). By mentioning the latest tools/technologies we must say that the availability of the online platforms and IT support as the main two factors of the distance learning; affects the overall process. One more point to discuss is the risks associated with distance learning are not only restricted to the risk associated with the technical system, but also cater to the teaching methodologies, examination, and evaluation of students' learning processes.

An important point to discuss is the significant risks that associated with the distance learning is the security and safety of the education system through the online platform which needs to be considered as threats to be solved to avoid all obstacles (Alnazer et al., 2017; Haitham Alzoubi and Ahmed, 2019). By search for an effective protection software to secure the safety of the education system or education online platform, and to improve the authenticity and the effectiveness and efficiency of the distance learning process.

We do agree on that the technology distance learning can mitigate unknown risk; considering COVID-19 as unknown risk must of the schools/universities shut down and closed. But, with the availability of great educational systems, online platforms, IT support and infrastructure of the internet. All together help the organizations in ensuring the continuity of the educational process which mitigated the negative expected occur outcomes in the education sector. Taking UAE as an example

of supporting the above agreement; Prior to the announcement of the Ministry of Education (MoE) to starting the teaching and learning from a distance most of the educational organizations were able to start the day after due to the strong internet and communication infrastructure and the availability of the sources and technologies. On March 22, Sheikh Mohammed bin Rashid, the Vice President and Ruler of Dubai attended the first tele-school day in the state's schools (Alzoubi et al., 2020a, 2020b; Mehmood et al., 2019). His Highness wrote on Twitter that 1.200 Million students are enrolled in our government schools, private sector schools and out national universities" (The National, 2020). Moreover, HBMSU is a great example as well where being the first smart university in the UAE shows that there are already leading this initiative prior to others where it was inaugurated in 2009 (Alzoubi and Yanamandra, 2020; Alzoubi et al., 2020a, 2020b; Joghee et al., 2020). Briefly, we can say that there is a positive relationship between mitigation unknown risk and the availability of tools/technologies. Where adopting new process and technologies play a big role in dealing with unknown risks (Hamadneh et al., 2021; Hanaysha et al., 2021a, 2021b).

One of the common hypothesis that most of the interviewee referred to is the government and the educational organization's needs to study the adopting of the distance learning as an alternative way of teaching and learning process (Alnuaimi et al., 2021; Alshurideh et al., 2020a, 2020b, 2020c; Alzoubi et al., 2021). We also agree on that; where the new situation we are facing now is considering as the new norm, based on that our way of thinking, about building our future and innovative strategy should be redesigned based on planning for unknown risk.

Technology is the rescue; over the past few months we have seen how distance learning technology is helping the governments in the absence of the virus within the schools' facilities. According to Jiang and Ryan "Digitalized economies have lower epidemic risks and explain some channels through which risks can be mitigated". As follow (Fig. 1) the World Bank has shown that countries with wider internet access and safer internet servers tend to be more resilient to epidemics such as COVID-19 (Ali et al., 2021; Alzoubi and Aziz, 2021; Ghazal et al., 2021). Therefore, learning process through the online platforms connects millions of students to their teachers from home during the pandemic to contain the spread of the COVID-19 that's practically mitigated the current risk.

6 Conclusion

The world events are often an inflection point for rapid innovation—a clear example is the distance learning. The COVID-19 pandemic effected all organizations in varying proportions depending on organization's risk management strategy, on the adopted technologies and available tools, and on it are internal and external recourses. By now the successful organization must have prepared innovative plans that build to avoid or mitigate the unknown risks. In addition to that, the application of the distance learning is hypothetically limitless and could be the new norm of the education system (Al

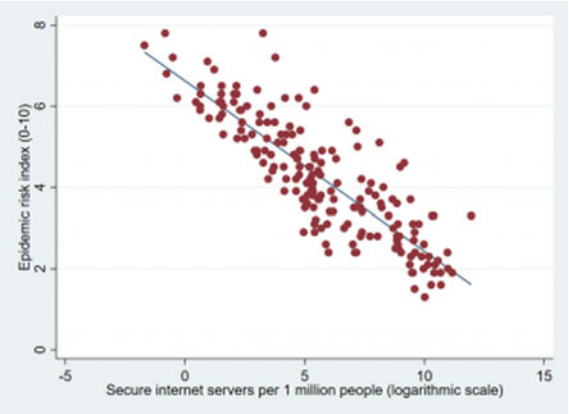


Fig. 1 World Bank Group's World Development Indicators

Kurdi et al., 2021; Alhamad et al., 2021). The technology nowadays exists to deliver an efficient and effective education system where it helps in overcoming barriers of distance, time, cost, and educational resources being continued refinement due to ensure continuity of education.

7 Recommendations

1. Government should consider keeping the distance learning and remote work as an alternative way of continuing business in the UAE.
2. Free online courses and e-library to fulfill the needs of all students.
3. COVID-19 pandemic has rearranged the education systems. The organizations must be reconsidered the infrastructure of the learning in the world, especially in the poor countries.
4. Implementation of an effective risk mitigation planning and enhanced risk analysis need to be followed to make early detection of the known and unknown risk factors.
5. Maintain the possible resources that the organization utilizes include critical pathway, workforce, memory and error budget.

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Pharmacy Education and Conducting OSCE Exam During COVID-19: An Overview

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Abstract Advances in pharmacy practice have transformed the role of a pharmacist from traditional dispensing to more patient-centered care practices. Apart from the traditional dispensing practices, pharmacists are currently assigned to provide pharmaceutical care services focusing on identifying medication-related problems, taking a medication history, patient interviewing, and designing an evidence-based care plan. The advancement of the pharmacist's role to be part of the health care team to maximise the health care provided to the patient should be met with restructuring the pharmacy education and assessment from being focused only on medicine compounding, selling, and dispensing to include pharmaceutical care provision. Undergraduate pharmacy education has changed tremendously over the years, evidenced by the shift from a customer-based approach to a patient-centered approach using different clinical learning and examinations models such as Objective Structured Clinical Examination (OSCE). OSCE exam is considered a powerful and valuable tool for evaluating pharmacy students' clinical performance. During the COVID-19 pandemic, pharmacy education and examination are globally affected. Many pharmacy schools are confronting surpassing challenges to sustain education

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_30

during the COVID-19 pandemic. The global experiences of academics and healthcare instructors in delivering emergency remote teaching, ensuring purposeful experiential pharmacy student placements, communicating and supporting the displaced or isolated pharmacy students are considered an accelerating opportunity for new models of pharmacy education. Therefore, this chapter aims to have an overview of pharmacy education during the COVID-19 pandemic, the challenges to online pharmacy education, and the impact of the COVID-19 pandemic on pharmacy learning and education. Also, to have an overview about conducting OSCE clinical examination during COVID-19; the online OSCE exam preparation, set up, implementation, and assessment during COVID-19. Finally, to describe what can happen in the future to the online pharmacy student clinical education, OSCE assessment, and examination.

Keywords Pharmacy education · COVID-19 · OSCE exam

1 Overview of Pharmacy Education During COVID-19

The COVID-19 pandemic has impacted the educational sector globally (AlHamad et al., 2012; Alhamad et al., 2021; Lyons et al., 2020). As a result, many pharmacy schools were suspended their campus activities and quickly transitioned their teaching and assessment strategies to an emergency remote online courses delivery (i.e., no face-to-face interaction) (AlHamad et al., 2014; Ali et al., 2021; Hall et al., 2020; Kawaguchi-Suzuki et al., 2020; Lyons et al., 2020; Mohamed et al., 2020). In addition, the COVID-19 pandemic has driven pharmacy schools and higher institutions to adjust their teaching and learning strategies to comply with international and national safety measures, including reduced movements of staff and students due to lockdowns, movement control orders, and global border closures (Al Hamad, 2016; Hall et al., 2020; Mohamed et al., 2020; Tolsgaard et al., 2020). Hence, institutions employed online-based teaching and learning using various information technology platforms (Al Hamad, 2016; AlHamad et al., 2012, 2014).

Both academic staff and pharmacy students faced challenges to ensure smooth delivery of synchronous and asynchronous online teaching, including remote delivery, experiential placements, and academic integrity with assessments (Hall et al., 2020; Kawaguchi-Suzuki et al., 2020; Rajab et al., 2020; Tolsgaard et al., 2020). Also, academic staff should be agile and flexible while delivering online teaching considering the significance of showing empathy and patience to students and each other (AlHamad & Al Qawasmi, 2014; Brazeau & Romanelli, 2020; Kawaguchi-Suzuki et al., 2020; Mohamed et al., 2020; Tolsgaard et al., 2020). Fortunately, and in some aspects, many of these challenges can be faced. First, a curriculum transformation focusing on active learning and skill development should be achieved to ensure purposive experiential training and support remote students (Brazeau & Romanelli, 2020; Hall et al., 2020; Lyons et al., 2020). Second, the use of a mix

of face-to-face, blended learning, and online based on course and program competencies (Fuller et al., 2020; Kawaguchi-Suzuki et al., 2020). Finally, there is a need for a comprehensive understanding of how the COVID-19 pandemic accelerates the need of having new teaching models for pharmacy students considering the need to conduct clinical examinations such as Objective Structured Clinical examinations (OSCE) (Hall et al., 2020; Lyons et al., 2020). This requires significant efforts from academics, healthcare instructors, and pharmacy students to become comfortable with various technological platforms and adjust to the educational challenges of the COVID-19 pandemic.

The OSCEs require a face-to-face assessment of clinical skills, which presents a significant challenge to schools and academic staff in the health profession, including pharmacy, especially during pandemic situations such as COVID-19 (Awaisu et al., 2007; Sepp & Volmer, 2021; Zayyan, 2011). As a result, medical and pharmacy schools switched to online-based clinical training and examination; for example, many schools used online-based OSCE (e.g., web-based, virtual, tele-OSCE). However, with a significant variation in the online platforms used, the patient's and academic staff skills, and ability to use the online technology, there is a need to evaluate these alternate methods of online OSCE in contrast with traditional face-to-face OSCE.

2 Challenges to Online Pharmacy Education

Many pharmacy schools and universities have transitioned from traditional face-to-face teaching methods to online or a combination of online and traditional education (i.e., blended learning) during the COVID-19 pandemic (Orleans, 2014; Rajab et al., 2020). Blended learning includes replacing part of the face-to-face interaction with online instruction (Edginton & Holbrook, 2010). This demonstrates how online education continues to grow in which face-to-face teaching is transformed into an online environment (Rajab et al., 2020). However, the subsequent enforcement of social distancing (i.e., increasing the physical space between people) due to the COVID-19 pandemic has forced pharmacy schools and universities to have an empty classroom as students kept away from their institutions (Rajab et al., 2020). Consequently, these institutions have switched automatically into distance learning using the most convenient conferencing platforms, email, and phone (Lederman, 2020).

The COVID-19 pandemic negatively impacted online learning in different ways. First, the transition from the traditional face-face into online education was challenging to many pharmacy schools and institutions as they were not ready (Esani, 2010; Rajab et al., 2020). Also, students become financially vulnerable because of the negative COVID-19 impact on the economy; therefore, they were worried about their ability to afford pharmacy school fees (Rajab et al., 2020). Finally, academic staff and students have other duties due to being at home, such as managing their children who are not in the school and other family members (Rajab et al., 2020).

Other challenges to online education were reported in the literature. For example, time management issues, the use of information technology tools, academic staff-student communication, and the lack of face-face (i.e., in-person) interaction and assessment tools (Esani, 2010; Rajab et al., 2020). The quality and access of online learning (i.e., poor or unavailability of the internet) is another issue (Rajab et al., 2020). Not all academic staff and students have access to laptops or high-speed internet at home (Rosen & Weil, 1995). Also, technophobia and the user age (academic staff and students) have negatively impacted the online learning process (Rosen & Weil, 1995). Other challenges such as not having a comfortable and quiet (i.e., noise-free) room and the additional tasks that come with online learning were reported by academic staff and students in the literature. Students reported that there is no campus atmosphere to create social interaction and may need to go back and listen to the recorded video (difficult and time-consuming for the students). Academic staff had reported difficulties following up and controlling students outside the country and were not satisfied with online exams and assessment as memory testing is not the best measure of learning in any environment (Ferri et al., 2020; Hall et al., 2020; Rajab et al., 2020). These challenges significantly affect the adoption of technology-enabled online learning (Chiasson et al., 2015).

3 The Impact of COVID-19 Pandemic on Pharmacy Learning and Education

The COVID-19 pandemic has created global challenges in pharmacy learning and education. Despite this, technology-enabled online learning and education adoption would be considered an advantage (Lederman, 2020). The COVID-19 situation facilitates the distribution and global acceptance of technology-enabled online learning (Hixon et al., 2012; Orleans, 2014). Also, the COVID-19 situation forced pharmacy schools and institutions to prepare and support their academic staff and students, which means implementing a new culture for online learning or blended learning (Rajab et al., 2020). Furthermore, online education was reported to be more convenient to students and academic staff. It requires not to travel to the pharmacy school campus, which saves them the hustle time with no or less travel and housing cost; students can work and still attend the lecture online (Ahmed et al., 2021; Almaghaslah et al., 2018).

Pandemics such as COVID-19 are a global health and economic crisis not just to learning and education (Alhamad et al., 2021). However, identifying learning and educational challenges would be primary in transforming them into innovative opportunities and brighter realities by preparing pharmacy students to impact their communities, country, and world (Mohamed et al., 2020). One of the significant opportunities is engaging pharmacy students and academic staff in transforming the current pandemic-imposed remote pharmacy learning into an evidence-based learning model (Al-Alami et al., 2021). Students and academic staff should learn

from the COVID-19 pandemic and use their experiences and lessons to continue improving online pharmacy learning and education, advance the vital role of pharmacists in patient care and conduct the scholarly research needed for future advances in inpatient care (Strawbridge et al., 2021). The future of online learning education is uncertain. However, academic staff, students, pharmacy schools, and institutions should be ready and have an alternate plan in the future for such similar situations that may require switching partially (i.e., blended learning) or ultimately (i.e., online education) (Strawbridge et al., 2021).

Adapting to the pandemic situations such as COVID-19 should impose elaborative planning, creativity, flexibility, and collaboration by all key stakeholders (i.e., Countries and governments, pharmacy schools and institutions, academic staff, and students). Also, future research should be conducted to evaluate and provide an insight into how and to what extent pharmacy students' knowledge, skills, and attributes are affected as a result of the educational transformation during and post-pandemic situations such as COVID-19.

4 Conducting OSCE During COVID-19

The objective structured Clinical Examination (OSCE) can be defined as a clinical performance examination used in health education and medical disciplines such as physicians, pharmacy, nursing, and dentist (Harden et al., 1975, 2015; Khan et al., 2013). OSCE exam, developed in the mid-1970s, has become a standard gold examination to assess a wide range of students' clinical skills and competencies such as history taking, communicational and interpersonal skills, professionalism, critical thinking, clinical reasoning, and clinical examination (Blamoun et al., 2021; Harden et al., 1975; Majumder et al., 2019). Therefore, OSCE is a robust, extraordinary, functional, and significant tool of summative and formative clinical assessment of the competencies and highly effective psychometric assessment that require the learner not just to "know-how" but to "show-how" and demonstrate their competencies in practice (Alnasser, 2016; Blamoun et al., 2021; Miller, 1990). However, the non-verbal behaviour of the student, patient, examiner, and the environment in which the OSCE exam is implemented would affect the examiner's decision and the reliability of the OSCE exam (Alnasser, 2016; Blamoun et al., 2021). OSCE exam comprises a series of stations through which all candidates rotate on a timed basis (Harden & Gleeson, 1979; Newble, 2004). In each station, the candidate faces a simulated task or problem; these candidates are asked to perform a specific task or deal with the addressed problem (Almuqdadi et al., 2017; Majumder et al., 2019). As a performance-based assessment method, OSCE measures cognitive learning, essential practice skills, and the ability to communicate effectively using problem-solving skills (Blythe et al., 2021; Mohamed et al., 2020).

In the view of the COVID-19 pandemic, which led to the online transformation of teaching activities and assessment, academic staff (i.e., educators) and learners (students) of pharmacy schools and institutions globally faced several challenges

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in conducting realistic and face-face OSCE (Blythe et al., 2021; Craig et al., 2020). Online OSCE, sometimes referred to as remote, virtual, or tele-OSCE, is a new model of implementing OSCE (Blamoun et al., 2021; Blythe et al., 2021). Transforming into online OSCE necessitates changes to the standard face-face OSCE (Blamoun et al., 2021; Blythe et al., 2021). For example, educational objectives and assessment need to be reformed to be consistent with the online style (i.e., online properties need to be introduced) of conducting OSCE. Also, standardised training for student examiners and patients is required to translate in-person to an online OSCE environment (Blamoun et al., 2021; Blythe et al., 2021).

Online OSCE would be feasible and practical. No extra efforts, fewer costs, and logistics are required for exam preparation, setup, and implementation; for example, it is paperless and safer when it comes to pandemics (Shaban et al., 2021). However, online OSCE requires a higher number of examiners and patients, training and awareness of students, examiners, and patients, making online OSCE very impractical and time-consuming for many students (Blythe et al., 2021; Shaban et al., 2021). Also, online OSCE is affected by technology such as the need for Information Technology (IT) supporting staff presence, multiple computers, and other electronic devices, and requires generating multiple channels in the platform used and is highly affected by internet connection and device (e.g., microphone & camera) functionality (Blythe et al., 2021; Craig et al., 2020). Furthermore, in online OSCE, it is difficult to include a competency-based assessment of clinical examination (Blamoun et al., 2021; Shaban et al., 2021). Also, the lack of student in-person presence would affect the exam performance the ability of examiners to assess the student compared to the standardised face-face OSCE exam (Shaban et al., 2021).

The content of OSCE questions developed to assess the student clinical skills should be developed based on the nature of online OSCE compared to the standardised OSCE, which assesses a broader range of clinical examination skills; thus, a more concise OSCE blueprint is mandatory (Shaban et al., 2021).

To overcome the challenges of conducting online OSCE, some pharmacy schools and institutions used realistic simulation techniques in a three-dimensional (3D) virtual environment with an interactive simulator system of clinical cases or web-based immersive technology to assess clinical skills (Faria et al., 2021).

5 What Can Happen to Online Pharmacy Student Clinical Education, OSCE Assessment, and Examination in the Future?

The online assessment (paperless) may be considered an advantage over other traditional assessments where the student can have instant feedback on their education assessment from their academic instructors (Walsh, 2015). Also, the academic instructors can easily monitor pharmacy students learning progress and achievements (Craig et al., 2020). Despite this, the online OSCE assessment has costs of being

dependent on technology, time-consuming and labour intensive, and the inability to assess Students' physical examinations and procedural skills would be a limitation (Walsh, 2015). Also, the logistics of the distribution and completion of examiner checklists would be another limitation (Craig et al., 2020).

The future of online clinical pharmacy education, assessment, and examination (e.g., OSCE) is vague and highly depends on the integrational success of virtual simulation-based technologies and implementing virtual clinical experience into the pharmacy training courses to achieve the clinical competencies and outcomes (Egarter et al., 2020; Kim, 2006; Walsh, 2015). Therefore, pharmacy schools and institutions should be prepared by having a proactive plan for a pandemic situation such as COVID-19 in the future. Currently, the standard face-to-face OSCE would still be the common practice, with online OSCE being an alternative in a pandemic or lockdown situation.

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Business and Data Analytics

Using Logistic Regression Approach to Predicating Breast Cancer DATASET

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Abstract The aim of this study is to predicate breast cancer by using three approaches: Multilayer perceptron, multiple linear regression, and logistic regression, then make a comparison between the performance of these approaches to decide the best approach to analyses the Wisconsin breast cancer dataset. In this study, we used the Wisconsin breast cancer dataset (699 instances and 11 attributes). Three approaches (multilayer perceptron, multiple linear regression, and logistic regression) were applied to the dataset to predicate the Wisconsin breast cancer. Performance was calculated for each approach and a comparison was made between the three approaches to see which is better. From the performance comparison between multi-layer perceptron, multiple linear regression, and logistic regression, the Wisconsin breast cancer dataset is best to analyses using multi-layer perceptron, with 100% compared to logistic regression 97.6% and multiple linear regression 84.4%. The computerized and especially logistic regression model could be useful to the predicate for many fields of science. For this reason, it's used abundantly in the medical field specially to build a model to predicate breast cancer. The conclusion

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_31

from this experiment showed that not all the independent variables have the coefficient effect with the dependent variable. However, the logistic regression approach is the best approach to analyses the Wisconsin breast cancer dataset rather than the multi-layer perceptron and multiple linear regression approach.

Keywords Logistic regression · Breast cancer · Multinomial logistic regression · Multi-layer perceptron · Multiple linear regression

1 Introduction

We address in this paper issues such as the global concept and interpretation of logistic regression and the process to apply those concepts is divided into a few sections with some illustrative, the first section containing the overview on the logistic regression which is used to mining the data in this study. The second section is the information about the datasets and methods used to analyze the data using logistic regression in SPSS tools. In the final section, the study explains the result and conclusion of the mining activity done to the datasets of Wisconsin breast cancer which been investigated. Logistic regression is part of a category of statistical models called generalized linear models. This broad class of models includes ordinary regression and ANOVA, as well as multivariate statistics such as ANCOVA and log-linear regression. An excellent treatment of generalized linear models is presented in Agresti (2018). Logistic regression allows one to predict a discrete outcome, such as group membership, from a set of variables that may be continuous, discrete, dichotomous, or a mix of any of these. Generally, the dependent or response variable is dichotomous, such as presence/absence or success/failure. A discriminate analysis is also used to predict group membership with only two groups. However, discriminate analysis can only be used with continuous independent variables. Thus, in instances where the independent variables are categorical, or a mix of continuous and categorical, logistic regression is preferred. The goal of logistic regression is to correctly predict the category of outcome for individual cases using the most parsimonious model. To accomplish this goal, a model is created that includes all predictor variables that are useful in predicting the response variable. Several different options are available during model creation. Variables can be entered into the model in the order specified by the researcher or logistic regression can test the fit of the model after each coefficient is added or deleted, called stepwise regression. There are two main uses of logistic regression. The first is the prediction of a group membership. Since logistic regression calculates the probability of success over the probability of failure, the results of the analysis are in the form of an odds ratio. For example, logistic regression is often used in epidemiological studies where the result of the analysis is the probability of developing cancer after controlling for other associated risks. Logistic regression also provides knowledge of the relationships and strengths among the variables (e.g., smoking 10 packs a day puts you at a higher risk for developing cancer than working in an asbestos mine).

2 Literature Review

The logistic regression approach is useful, researchers use it to predicate many diseases or to develop strategies for controlling these diseases, and it might be considered the cornerstone to improve these diseases. Several ancient studies have been used the logistic regression approach in many fields such as (Carpio et al., 2007; Choi et al., 2008; Giasson et al., 2006; Kemp & Alliss, 2007; Kyle et al., 2002; Larson, 2002; Olson & Olson, 1986; Rosa et al., 1981, 1992; Wang et al., 2004; Wolberg & Mangasarian, 1990; Zhang, 1992) studied the regression analysis and developed models to achieve predictive models. Their studies explained predictive models usage to predicate and improvement the systems output. In recent studies many researchers they studied breast cancer and they tried to build many of models to predicate and deal with the breast cancer. (Chaurasia & Pal, 2014) presented a diagnosis system for detecting breast cancer based on RepTree, RBF Network and Simple Logistic. To evaluate the proposed system performances, they applied tenfold cross validation method in test stage to the University Medical Centre, Institute of Oncology, Ljubljana, Yugoslavia database. The proposed system has a right classification rate of 74.5%. The study showed that Simple Logistics can be used to reduce the size of the feature space and the Rep Tree and RBF Network model proposed can be used to obtain fast automatic diagnostic systems for other diseases. According to the same researchers (Chaurasia & Pal, 2007). They said that Sequential Minimal Optimization (SMO) has higher prediction accuracy i.e. 96.2% than IBK and BF Tree methods.

The three methods were used for developing accurate prediction models for breast cancer by using data mining techniques. They used breast cancer data with a total 683 rows and 10 columns. Rajesh and Anand (2012) applied C4.5 classification algorithm to SEER breast cancer dataset to classify patients into three group (either "Carcinoma in situ" (beginning or pre-cancer stage) or "Malignant potential"). Rajesh and Anand (2012) Pre-processing techniques were applied to prepare the raw dataset and to identify relevant classification attributes. In order to get classification rules, random test samples were selected from the pre-processed data.

The rule set that was obtained was checked on the remaining data. In 2011, (Gupta et al., 2011) hey presented study paper summarized various review and technical articles on breast cancer diagnosis and prognosis. They presented an overview of the current research being carried out using the data mining techniques to enhance the breast cancer diagnosis and prognosis.

This study has the following objectives:

1. To study distribution of Wisconsin breast cancer data.
2. To examine the relationship independent variables (attributes) and the dependent variables (target or class).
3. To build logistic regression model for Wisconsin breast cancer data set.

3 Method

This section describes the used dataset in this paper and the acquisition of the dataset, which has been described in detail in the following subsection.

3.1 Data Description

The Wisconsin breast data has been acquired through UCI machine learning repository. Several researchers have used the same data in their study. Based on the information provided at the above URL, there details description about Wisconsin breast cancer data (Table 1).

1. Number of Instances: 699.
2. Number of Attributes: 10 plus the class attribute.
3. Attribute Information: (class attribute has been moved to last column).

There are 26 missing values in Groups 1 to 6 that contain a single missing (i.e., unavailable) attribute value, now denoted by "?".

Class distribution of the Wisconsin breast cancer data is: Benign: 458 (65.5%). Malignant: 241 (34.5%). The distribution of data can also be represented in a bar char as shown in Fig. 1.

1. Logistic regression tools

The logistic regression model for Wisconsin breast cancer can be written as follows:

Table 1 Data description

#	Attribute	Code	Domain
1	Sample code number	CodeNum	id number
2	Clump thickness	CThick	1–10
3	Uniformity of cell size	CellSize	1–10
4	Uniformity of cell shape	CellShape	1–10
5	Marginal adhesion	MasAd	1–10
6	Single epithelial cell size	EpiCells	1–10
7	Bare nuclei	BareNuc	1–10
8	Bland chromatin	BlChr	1–10
9	Normal nucleoli	NormNuc	1–10
10	Mitoses	Mito	1–10
11	Class	Cl	2 for benign 4 for malignant

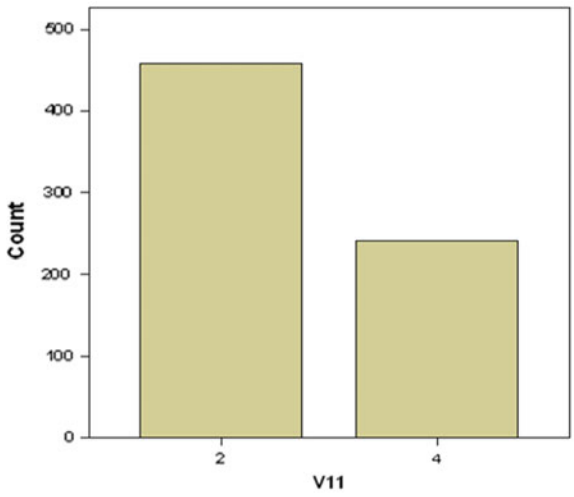

Fig. 1 The distribution of data

Cons. + B1 * CThick + B2 * CellSize + B3 * CellShape + B4 * MarAd + B5 * EpiCells + B6 * BareNuc + B7 * BlChr + B8 * NormNuc + B9 * Mito.

P = 1/1 + e.

Several steps should be performed to obtain the model:

1. Determine the relationship between the independent and dependent variables is liner. Draw a scatterplot diagram.
2. If the relationship between the independent and dependent variables is not liner, take a natural log of particular independent variables. In this study a Multinomial regression is used since the dependent variable has more than 2 classes of target (Wisconsin breast cancer).
3. Draw the scatterplot diagram again.
4. Get case processing summary and classification table and describe the distribution of data i.e. indicating how many of datasets represent each target class, and mention if there is any missing value.
5. Provide the model fitting information and form hypothesis for Chi-Square.
6. Get Wald-statistics table.
7. If the particular logit is not significant, get the correlation matrix.

First draw the scatterplot diagram to indicate the relationship between the independent and dependent variables, see Fig. 2.

The relationship between the dependent variable (V11) and the independent variables (V2 to V10) is not linear. Therefore, the attributes values should be transformed using logarithmic function (Naperian log or loge). After applying Naperian log to the dataset.

Once the logarithmic function has been applied all values (Except V1 and V11), the scatterplot should be obtained to determine the relationship of the variables for building the model. As shown in Fig. 3, the relationship between the dependent

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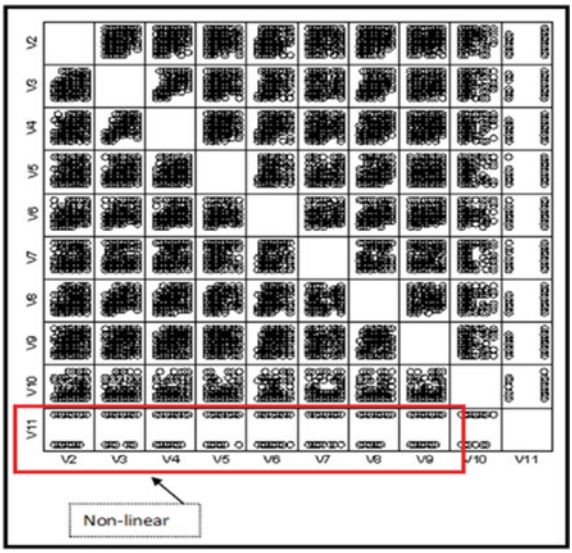

Fig. 2 The scatterplot diagram to indicate the relationship between the indepenent and dependent variables

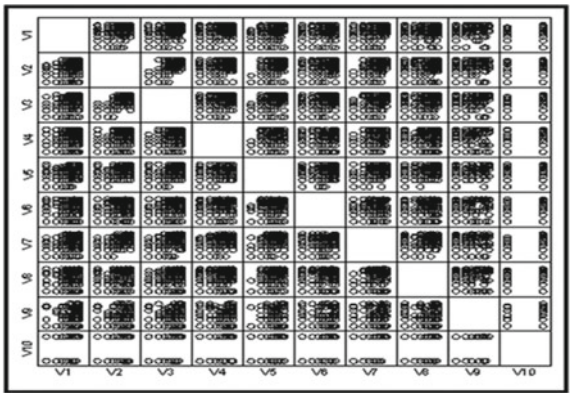

Fig. 3 Scatterplot for transformed dataset

and independent variables is not linear. Therefore, a logistic regression analysis is more suitable for this data. Multinomial Logistic Regression tool used is SPSS for processing the dataset.

4 Results

4.1 Distribution of Data

Table 2 show the case processing summary:

Table 2 Case processing summary

Unweighted cases[a]		N	Percent
Selected cases	Included in analysis	699	100.0
	Missing cases	0	0.0
	Total	699	100.0
Unselected cases		0	0.0
Total		699	100.0

[a]If weight is in effect, see classification table for the total number of cases

The minimum ratio of valid cases to independent variables for logistic regression is 10 to 1, with a preferred ratio of 20 to 1. In this analysis, there are 699 valid cases and 9 independent variables. The ratio of cases to independent variables is 77.6 to 1, which satisfies the minimum requirement. In addition, the ratio of 77.6 to 1 satisfies the preferred ratio of 20 to 1.

1. **Hypotheses**: there is no different between the model with only a constant and the model with independent variables.
2. **Significant value**: sine the significant value is < 0.05, therefore reject the hypothesis.
3. **Conclusion**: there is a different between the model with only a constant and the model with independent variables.

The presence of a relationship between the dependent variable and combination of independent variables is based on the statistical significance of the model chi-square at step 1 after the independent variables have been added to the analysis.

In this analysis, the probability of the model chi-square (783.516) was < 0.001, less than or equal to the level of significance of 0.05, see Table 3. The null hypothesis that there is no difference between the model with only a constant and the model with independent variables was rejected. The existence of a relationship between the independent variables and the dependent variable was supported.

As seen in Table 4, the independent variables could be characterized as useful predictors distinguishing survey respondents who have not seen an X-rated movie from survey respondents who have seen an X-rated movie if the classification accuracy rate was substantially higher than the accuracy attainable by chance alone. Operationally, the classification accuracy rate should be 25% or more high than the proportional by chance accuracy rate. The proportional by chance accuracy rate was computed by first calculating the proportion of cases for each group based on the

Table 3 Omnibus tests of model coefficients

Step 1	Chi-square	df	Sig
Step	783.516	9	0.000
Block	783.516	9	0.000
Model	783.516	9	0.000

Table 4 Classification

Observed		Predicted		
		V11		Percentage Correct
		2	4	
	V11			100.0
Step 0	2	458	0	
	4	241	0	0.0
Overall Percentage				65.5

[a]Constant is included in the model
[b]The cut value is 0.500

number of cases in each group in the classification table at Step 0. The proportion in the "2" group is 458/699 = 0.6552. The proportion in the "4" group is 241/699 = 0.3447. Then, we square and sum the proportion of cases in each group ($0.6552^2 + 0.3447^2 = 0.5481$). 0.5481 is the proportional by chance accuracy rate.

The accuracy rate computed by SPSS was 97.6% which was greater than or equal to the proportional by chance accuracy criteria of 68.5% ($1.25 \times 54.8\% = 68.5\%$). The criteria for classification accuracy are satisfied.

4.2 Pseudo R Square

Among the three pseudo R-square Nagelkerke obtained the highest accuracy i.e. 93.1 as shown in Table 5.

1. While logistic regression does compute correlation measures to estimate the strength of the relationship (pseudo R square measures, such as Nagelkerke's R^2), these correlations measures do not really tell us much about the accuracy or errors associated with the model.
2. A more useful measure to assess the utility of a logistic regression model is classification accuracy, which compares predicted group membership based on the logistic model to the actual, known group membership, which is the value for the dependent variable.

Table 5 Model summary (Pseudo R–Square)

Step	−2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	117.012[a]	0.674	0.931

[a]Estimation terminated at iteration number 8 because parameter estimates changed by less than 0.001

Table 6 Parameter estimates

Step 1[a]	B	S.E	Wald	df	Sig	Exp(B)
CThick	0.531	0.132	16.237	1	0.000	1.701
CellSize	0.006	0.186	0.001	1	0.975	1.006
CellShape	0.333	0.208	2.567	1	0.109	1.395
MasAd	0.240	0.115	4.380	1	0.036	1.272
EpiCells	0.069	0.151	0.212	1	0.645	1.072
BareNuc	0.400	0.089	20.041	1	0.000	1.492
BlChr	0.411	0.156	6.918	1	0.009	1.508
NormNuc	0.145	0.102	2.003	1	0.157	1.156
Mito	0.551	0.303	3.311	1	0.069	1.734
Constant	−9.671	1.051	84.623	1	0.000	0.000

[a]Variable(s) entered on step 1: CThick, CellSize, CellShape, MasAd, EpiCells, BareNuc, BlChr, NormNuc, Mito

4.3 Wald Statistic

Variables in the equation as shown in Table 6.

Multicollinearity in the logistic regression solution is detected by examining the standard errors for the B coefficients. A standard error larger than 2.0 indicates numerical problems, such as multicollinearity among the independent variables, zero cells for a dummy-coded independent variable because all of the subjects have the same value for the variable, and 'complete separation' whereby the two groups in the dependent event variable can be perfectly separated by scores on one of the independent variables. Analyses that indicate numerical problems should not be interpreted. None of the independent variables in this analysis had a standard error larger than 2.0. (The check for standard errors larger than 2.0 does not include the standard error for the Constant).

1. **Hypothesis**: The coefficients for variables (nine variables) are zero.
2. **Significant value**: since the significant value for (9 value) are < 0.05. (e.g. $p = 0.06$, 0.000 and 0.0024)). Reject the hypothesis.
3. **Conclusion**: the coefficients for 9 values are not zero.

The probability of the Wald statistic for the variable CThick was 0.001, less than or equal to the level of significance of 0.05. The null hypothesis that the b coefficient for CThick was equal to zero was rejected. This supports the relationship that "survey respondents who were older were more likely to have not seen an X-rated movie."

The value of Exp(B) was 1.701 which implies that a one unit increase in CThick increased the odds that survey respondents have not seen an X-rated movie by 53.1%. This confirms the statement of the amount of change in the likelihood of belonging to the modeled group of the dependent variable associated with a one unit change in

Table 7 The performance of multi-layer perceptron, multiple linear regression and logistic regression

Method	Performance (%)
Multilayer perceptron	100.00
Multi Linear regression	84.4
Logistic regression	97.6

the independent variable, CThick. If variables are not significant, get the correlation table.

9.671-0.531CThick-0.006CellSize-0.333CellShape-0.240MarAd-0.060EpiCells-0.4BareNuc-0.411BlChr-0.145NormNuc-0.551Mito

5 Conclusion

The computerized and especially logistic regression model could be useful to predicate for many fields of science. For this reason, it's used abundantly in medicine field especially to build a model to predicating breast cancer.

The conclusion from this experiment showed that not all the independent variables have the coefficient effect with dependent variable. However, from the performance comparison between: Multilayer perceptron, multiple linear regression and logistic regression, the Wisconsin breast cancer dataset is best to analyses using multi-layer perceptron, with 100% compared to logistic regression 97.6% and multi linear regression 84.4% as shown in Table 7.

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The Usage of 3D Printing Technology by Small-Medium Sized Enterprise in Jordan

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Abstract The purpose of the current research paper is to measure the effectiveness of the usage of 3DPT applications by small-medium sized enterprises (SME) in Jordan as a case from developing countries. It also aims to test whether the extent of the usage of 3DPT applications differs across different SME in terms of their type, size, and experiences. Primary data were collected from 250 respondents and 23 measures of 3D technology effectiveness were employed. A questionnaire was developed and extracted from previous studies. Six factors for measuring 3D technology effectiveness were extracted, namely: (1) time, (2) cost, (3) quality, (4) innovation, (5) competitiveness and (6) management. The findings indicate the extent of the 3DPT being used by small-medium sized enterprises (SME) in Jordan could be considered quite good at this stage. It also provides positive evidence that the 3DPT technology effectiveness indicators are significantly related to the level of 3DPT applications being used by SMEs, particularly, cost, time, quality and innovation. The findings revealed that the extent of using 3DPT technology applications were differ among

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_32

the target respondents based upon their size while there were not differ in terms of their types and business experiences.

Keywords 3DPT applications · Small-medium –sized enterprises · Effectiveness measures · Jordan

1 Introduction

Some common aspects of new industry are the high changing technologies, systems and processes that affect the effectiveness, efficiency, and cost of production in some or in another group (Al Kurdi et al., 2020; Alshurideh et al., 2019, 2021, 2022; Alzoubi et al., 2021). Additive manufacturing known as 3D printing, is a new industrial revolution (Altamony et al., 2012; Berman, 2012; Hunaiti et al., 2009; Qian, 2020; Weller et al., 2015). It is a disruptive technology because it can have a fundamental impact on production processes, supply chain, product life-cycle planning, and consumer behavior, among other things (Abu Zayyad et al., 2021; Abualoush et al., 2018; Masadeh et al., 2020; Obeidat et al., 2019; Schniederjans, 2017; Westerweel et al., 2019; Wu & Chen, 2018). According to several academic studies, AM technology has several advantages over traditional manufacturing such as cost, speed, quality and innovation/transformation, for example, (Attaran, 2017) indicated that the advantages of 3D-printing to manufacturing have become more prolific as the technology continues to advance inflexibility and capabilities. 3D-printing has seen an exponential growth in the number of materials a 3D-printer can use to build objects (Alzaqebah et al., 2019; Kietzmann et al., 2015; Saliba et al., 2020; Schniederjans, 2017) Other researchers claim that small company is going to adaption 3DPT much than the large company (Lopes da Silva, 2013; Masadeh et al., 2021; Mellor et al., 2014). So, this is the core of any business to grow and sustain, and because this technology increases the innovatively, so it creates and gains several opportunities and expandability to add extra market share (Weller et al., 2015). Furthermore, AM technology allows the flexible production of custom products without imposing fines on manufacturing costs. This is done by using direct digital manufacturing processes that convert 3D data directly into physical parts, without the need for tools or templates. In addition, the category manufacturing principle can also produce functionally integrated parts in a single production step, reducing the need for assembly activities. Thus, AM technology greatly affects flexibility, customization, capital costs and marginal production costs (Berman, 2012; Ford & Despeisse, 2016; Weller et al., 2015).

Understanding the factors affecting the adoption of 3D printing applications has received great attention from academic researchers and professionals around the world (e.g., (Guo & Leu, 2013; Martinsuo & Luomaranta, 2018). Other studies have emphasized several benefits of adopting AM technologies, including design freedom, efficiency and speed, customization of products, enabling of small batches, flexibility, adaptability, simplification of supply chains and reduction of waste (Weller et al.,

2015). Furthermore, literature shows that many studies concerning challenges to AM adoption have been carried out solely in large firms (Flores et al., 2016; Rylands et al., 2016).

However, studies that examine measures the effectiveness of the usage of 3DPT applications by small-medium sized enterprises (SME) in Jordan as a case from developing countries are rarely available. Digital manufacturing technologies are expected to have tremendous advantages for businesses and industries, but these benefits are rarely realized in practice. Therefore, this study has come to answer the following question: to which extent the use of 3D-printing technology applications enhancing the effectiveness of small-medium sized manufacturing enterprises operations in Jordan? Furthermore, this paper aims to elaborate a better understanding of the relationship between the extent of the implementation of 3DPT applications (i.e., H3DPT scope) and its effectiveness might be useful for both mangers and practitioners. The outline of this research has other six sections. Section 2 comprehensively presents the theoretical background and literature review. Section 3 establishes a research model and proposes the research hypotheses. Section 4 describes the research method and data collection. Section 5 discusses data analysis. Section 6 summarizes research conclusion and implications.

2 Theoretical Background and Literature Review

2.1 3DPT: Definition and Value

3D printing is a recognized broad term of Additive Manufacturing (AM), which known as, the processes so as to convert a digital file or information piece by piece, surface by surface and layer to layer into physical obsession (Thompson et al., 2016). Furthermore, Rapid Prototyping (RP) and Rapid Manufacturing (RM) are two extensively acknowledged synonyms which are incremental manufacturing. Compared to RP and RM, AM is a supplementary generic marquee that reveals the processing strategy of this superior industrial technology (Mognol et al., 2006; Obeidat et al., 2017; Schniederjans, 2017).

3DP technologies were patented and marketed in the late 1980s and early on 1990s by companies such as Stratasys, 3D Systems, and EOS. For several years these technologies have been referred to as rapid prototype implements. Stimulating technological maturity and termination of patents for progress and adoption with the rising certainty that 3DP technologies can be used for speedy manufacturing, not just prototypes (Cerdas et al., 2017; Ruffo & Hague, 2007). To date, on the other hand, the employ of 3DP for end-use products and components is mainly limited to dedicated industries. For example, while creating tools on the International Space Station is a logical application, the commercial viability of doing so on the ground is disputed (Khoo et al., 2015; Rayna & Striukova, 2016).

3DP operations vary from conventional manufacturing in several major ways. First of all, 3DP is an additive, that is, it generates solid objects by adding together materials in layers, somewhat than eliminating the materials to produce the required shape. This feature offers the ability to lessen waste of raw materials, while energy use may be superior than in conventional processes (Huang et al., 2013). Second, 3DP stirs directly from the digital model to a physical object, lacking the necessitate for tools. This facilitates on-demand production with extremely short lead times (Petrovic et al., 2011). It also assists distributed manufacturing, since resources could be shared throughout the digital transmission of designs for manufacture near their point of use. This offers apparent benefits when demand is low, discontinuous, or geographically disseminated, for example in parts supply chains (Khajavi et al., 2014). Third, 3DP manufacturing is not subject to economies of scale that sustain conventional manufacturing as there is no cost consequence coupled with low volume production (Mellor et al., 2014).

3D Printing provides several benefits ranging from customization to ease of designing, an elasticity of prototyping and production, shortening the lead time, reducing wastage, and enhancing efficiency in the supply chain. As compared to the conventional manufacturing, these major benefits considered as (1) it is ability to produce customized products in small batches (Ford & Despeisse, 2016), (2) as designs are in digital form, can be shared, and manufacture can be outsourced (Berman, 2012; Ford & Despeisse, 2016), (3) it offers speed, easiness, and flexibility in designing and adjusting products (Berman, 2012), (4) it assists in reusing material and dropping waste, therefore, leading to material savings (Berman, 2012; Weller et al., 2015), (5) it can lead to less reliance on high energy consuming manufacturing activities such as forging, casting, etc. (Khorram & Nonino, 2017), (6) it can lead to an enhanced and shorter value chain (Khorram & Nonino, 2017), and (7) 3D Printing has also engrossed many researches from sustainability community owing to the various environmentally friendly and societal paybacks it can present (Ford & Despeisse, 2016).

In spite of a number of benefits the 3D Printing be able to offer, there are several challenges which are acting as restraints or barriers for 3D Printing execution in diverse organizations across industries. Some of these challenges are: (1) The high charge is involved in 3D Printing functioning (Berman, 2012; Ford & Despeisse, 2016), (2) Speed of manufacture is not yet up to the mark (Berman, 2012), (3) Limited selection of materials to work with (Berman, 2012; Weller et al., 2015), (4) AM faces disputes regarding the quality of output which could be in the form of restricted strength, opposition to heat and moisture, and color stability (Berman, 2012; Thompson et al., 2016), (5) AM is appropriate for manufacturing products in smaller quantities but faces a vast confront with large volumes (Khorram & Nonino, 2017), (6) Difficulty in decisive the mindset and approach of the designers (Ford & Despeisse, 2016), (7) Lack of knowledge and awareness among the organizations (Martinsuo & Luomaranta, 2018), (8) Status quo and struggle to change in the organizations (Martinsuo & Luomaranta, 2018), (9) Lack of management and leadership maintain (Martinsuo & Luomaranta, 2018) and (10) Intellectual Property Rights issues (Ford & Despeisse, 2016; Martinsuo & Luomaranta, 2018).

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2.2 Additive Manufacturing Technologies Applications

There are numerous systems and technologies for Additive Manufacturing, and over the years these technologies have developed and improved. Some of the most commonly discussed AM technologies are Selective Laser Sintering (SLS), Fused Deposition Modelling (FDM), Laser Melting (LM), Laminated Object Manufacturing (LOM), Stereo lithography (SL), Laser Metal Deposition (LMD), Electron Beam Melting (EBM), 3D Printing (3DP) among many others (Petrovic et al., 2011). According to Wong and Hernandez (2012), various technologies like Prometal, Polyjet, Laminated Engineered Net Shaping (LENS), and EBM were non-existent. The progress of new technologies or processes occurs like Stereolithography, Laser Beam Melting (LBM), MIT's 3D Printing process, laminated object manufacturing, Fused Disposition Modelling (FDM), and solid ground curing. In that period, not only there was a progress of technologies but also the thriving commercialization of these technologies, such as FDM, solid ground curing, Stereolithography, and laminated object manufacturing (Alananzeh et al., 2018; Thompson et al., 2016; Weller et al., 2015). New processes such as Electron Beam Melting (EBM) were improved and commercialized besides developing the existing technologies in 1990s and 2000s.

The enhancement in the technologies meant the processes were able to generate patterns, tooling and finishing parts. By the late 2000s, the 3D Printing industry became more effervescent as the patents pertaining to some of the 3D Printing technology processes perished which opened the doors for other players to contribute in the industry; the commoditization of AM processes which were commercialized before took place, together with growing AM hobby community, and invariable innovation (Chen et al., 2017). Also, the progression of AM can be characterized into three phases: Phase I- where AM processes mainly concerted on mock-ups of original designs, prototypes and models. Phase II- In this phase, AM processes enhanced and have had the ability to manufacture or generate finished products. 'Rapid Tooling' and 'Direct Digital Manufacturing' are other words that are occasionally used to refer to this phase. Phase III- At this phase, ultimate consumers will have the admission and be able to be the owner of the 3D Printers such as conventional Ink Jet and Laser Desktop Printers (Berman, 2012; Thompson et al., 2016).

From the applications view, 3D Printing applications used in various functions across diverse industries. Manufacturing, aerospace, transportation, medical, architecture, dental, hobbies, space exploration, education, military, art, and energy among others are extensively using the AM products and support services (Thompson et al., 2016; Weller et al., 2015; Wong & Hernandez, 2012). 3D Printing is predominantly used for prototyping and yet used for product development and innovation. Generally, it has been assured that 3D Printing is mainly used in applications concerning low production, small part sizes and having multifaceted printers (Berman, 2012).

2.3 Literature Review

The extant literature stresses on the importance of examining the value and the effectiveness of 3DP technology on manufacturing operations and functions. It has been recognized that one of the most significant challenges faced by managers and owners of small-medium sized enterprises today is assessing the effectiveness of using 3DPT applications in order to justify the value-added contribution of the 3DPT in achieving the organization's objectives (Thompson et al., 2016). Adopting and implementing of 3DPT applications may seem an important sub-system for many organizations, but unless it is an effective tool for manufacturing operations, its potential power would be significantly hindered. Recently, the relationship between using of digital technologies and its effectiveness has received great attention in the organizational and IT literature. Several researchers indicate that digital technologies, such as 3DP, can contribute to operation effectiveness in at least two relevant ways (e.g., Lu & Ramamurthy, 2011; Mishra et al., 2013). Firstly, digitally conduct business operation efficiency and assistance in overcoming uncertainty (Alshurideh et al., 2022; Alzoubi et al., 2021; Tariq et al., 2022). Secondly, IT helps to coordinate and synchronize business functions such as innovation, design product manufacturing and marketing (Bharadwaj et al., 2007; Candi & Beltagui, 2019; Kamaruddeen et al., 2022). Adopting digital tools in innovation can help enterprises achieve successful results from innovation projects (Marion et al., 2015). The relationship between flexible manufacturing systems, such as 3DP, and product innovation is a logical one, which was also empirical testing (Oke, 2013). As a result, the use of 3DP is expected to be associated with higher business performance. (Steenhuis & Pretorius, 2017) claims that the adoption of 3DP technology would affect business by improving their operational efficiencies objectives: quality, speed, flexibility and reliability cost.

According to Oettmeier and Hofmann (2017), operational efficiency is not considered as radical as strategic positioning effect of 3DP technology on business. The 3DP technology can have a big impact on poisoning (corporate image) on all players involved in supply chain i.e., suppliers, manufacturers and customers. The 3DP technology has the ability to make supply chains narrower as they provide an opportunity for integration and optimization product functions which to a certain extent exclude the need for sub-component suppliers. Thus, with the adoption of the company's 3DP technology, processes become more flexible due to the ability of technology to change product designs providing high quality services with decentralized production closer to consumer location. In addition, the 3DP technology not only affect the chain supply chain structure but also processes involved in the supply chain by grasping opportunities for product design through the new modified management and R & D processes. In this context, the adoption of 3DP technology can do changes in process planning and quality control processes.

According to Schniederjans (2017), the adoption of 3D printing technology allows fairly fast and fast prototypes enterprises, especially SMEs, to produce product models in a short time for quick testing and improving on-time parts that need to be improved. In this way, not only improves the production process but also enhances

creativity in the enterprises in the development of their products. Moreover, with the adoption of 3D printing technology enterprises not only quickly prototype but also significantly reduced costs with traditional models are inevitable. Other potential benefits of the adoption of 3DPT include: reduction in time-to-market, material savings by reduction of subtractive manufacturing processes, reduced need for tools, molds or punches, enhanced density of final part and fabrication of free-form enclosed structures (Schniederjans, 2017). Besides, lead times can be with the three-dimensional printing system significantly lower while can produce different forms of products simultaneously without additional switching costs and time (Weller et al., 2015).

When we come to the cost in the 3DPT usually, the cost concept includes three dimensions: printer cost, materials cost, and operating cost. Some researchers also indicate that 3DPT helps to get an optimal design, which leads to a decreasing consumption in materials up to 40% (Achillas et al., 2015), and all of these variables can be control and changed based on the quality and precision needed of the printed products, also the type of 3DPT and the model of the printer effect the cost, in some cases the cost get affected by a level of finishing required such as sanding, coloring, or any post-process needed, In addition, 3DPT helps to reduce labor cost, because the 3D printing process is completely automated (Dedoussis & Giannatsis, 2009); that gives high flexibility in RP cycle for NPD and the cancelation of molds and patterns is a great benefit that saves a lot of money and also saves high lead times (Oettmeier & Hofmann, 2017; Thompson et al., 2016), also, this technology is lowering the cost needed to invest in inventory space and its management (Liu, 2014; Müller & Karevska, 2016), because the working method in 3DPT is near to Just-in-Time (JIT) method so no need for big factory space (Fawcett & Waller, 2014).

Furthermore, increasing adoption of additive manufacturing may lead to a reduction in raw material cost through economies of scale (Al-Dmour et al., 2020; Alshurideh & Alkurdi, 2012; Ford & Despeisse, 2016; Thomas, 2016). Other important advantage of adopting 3D printing technology can be gained from the supply chain perspective. Enterprises now can manage with the product warranties, repairs and upgrades by offering to the customers a downloadable 3D printing design of the parts needed for repair. Additionally, a recent search appears that there are already some logistics enterprises that already apply 3D and small technology part of the thinking is to start applying it in their business operations. The search shows that enterprises that are not considering applying the 3DP technology in their operations are mainly because of their lack of information about the potential advantages that this technology offers business (Müller & Karevska, 2016). This also means that production in the developing country is low states will no longer be necessary because enterprises can produce at the same low-cost point of consumption without bearing any transportation costs and logistics. What was said, besides these advantages, many new services are available to appear as in this case market barriers are relatively low (Müller & Karevska, 2016).

One of the most common things in small- medium sized enterprises is the desire and passion of creating really new creative, good, and well-developed ideas in order to convert it to be good products that will have a good opportunity of acceptance in the

market, to gain a more loyal customer (Dimitrov et al., 2008). So many researchers said, that 3DPT is definitely improving product quality, on another side, it has many weak points such as poor surface quality, the accuracy of dimensions, a tolerance range of error, and some physical or mechanical issue (Khorram & Nonino, 2017). According to Oettmeier and Hofmann (2016), enterprises not only aim to achieve technological progress but also competitive advantages that distinguish them from competitors through highly innovative production customized products give value to the customer. Under this, the additives industry, also known as three-dimensional printing, was one of the latest industries Technological developments that Enterprises tend to adopt to improve them technological capabilities. The 3D printing was created with its rapid technological development these opportunities for Enterprises to reach and enhance the competitive advantage manufacturing capabilities (Rylands et al., 2016). It is clear that the 3DP technique is extensive adopted today as one of the subversive innovations that generate radical changes for one industry.

Additionally, many benefits from 3DPT drive to improve company's and products' competitiveness, but, developed countries face the problem of losing competitiveness in mass manufacturing while the 3DPT have it (Petrovic et al., 2011), so that what lead giant in mass production like China to adopt and invest great recourses in 3DPT (Bai et al., 2017), the results show growth in competitiveness of the early entrepreneurial startup's that adopt 3DPT in RM, especially with enterprises have vast experience in AM working for RM (Khorram & Nonino, 2017). 3DPT can also provide a competitive advantage, especially if the market is uncertain and demands a great variety of products and adaptability to varying customer needs (Weller et al., 2015), along with a shorter time to market (Weller et al., 2015). Petrovic et al. (2011) noted that there is a clear changing in management style and planning process for the SME company that adopting 3DPT, and that change happened in different areas such as needed infrastructure like electric power, material cost or wasting materials, space, inventory, labors or experts required, maintenance style, that facilitate logistics management and gives elasticity and a possible decrease in production costs. Also, AM affecting supply chain management by minimizing required stock holding (Fawcett & Waller, 2014), recently the concept of "Digital inventory" become popular in supply chain management, and the "Digital inventory" management model allows producing on demand for the users, like JIT model of providing for firms that can reduce storage expenses (Holmström et al., 2010), that increases inventory turnover (Tuck et al., 2006) and the ability to produce locally besides of that, AM requires fewer tools in the production process and employing fewer laborer's, also, developed operating capital management (Berman, 2012).

2.4 3DPT Status in Jordan

There is no doubt of 3DPT success, especially when we are talking about AM technology at the level of developed countries, there are very sophisticated uses, almost interference in all the simple and complex industries. From nuclear bombs (ExOne,

2014) and rockets used to travel through space to the uses of medical and therapeutic advances of heart surgery, arteries, brain and bones surgeries, also movie maker industry, fashion, and food. Moreover, its extensive uses of NPD that is technical or ordinary products such as kitchenware.

All of that because of the development has done in the entire ecosystem of entrepreneurship and innovation in developed countries. So, to look to the Jordanian ecosystem, the researchers follow the model adopted in the Brazilian entrepreneurial ecosystem of start-ups studies, which subtitled by Daniel Isenberg to determine domains of the entrepreneurship Ecosystem (Isenberg, 2011), and when he talks about the Entrepreneurship Ecosystem, he looks from a wide angle to see the broad picture and taking into his consideration all the major stakeholders in the ecosystem that affect adaptation of the new technologies and changes. So, that what we need in Jordan to guarantee a suitable environment that facilitates and incubate 3DPT in Jordan, to develop a comprehensive technological ecosystem that leverages the entrepreneurship ecosystem at this sector:

- **Policy and Laws Makers**: from governments and leaders and their role in enacting laws and legislation that facilitate and regulate the work of 3DPT sector.
- Financing System: from capital investments and lending policies for projects in 3DPT, and funding from international institutions to develop this sector.
- **Cultural System**: It means the way that society is seeing and focus on the success stories in this sector. Also, the social norms that have tolerance with mistakes, failures, and risk resulting from the core of RM and prototyping concepts that germane to the 3DPT and focus on the positive aspect of the development of creativity and innovation.
- **Support System**: about the infrastructure of energy, telecommunications, transportation, and Development Zones, in addition to non-governmental institutions in the private sector and its role in supporting entrepreneurship through conferences and courses and raising awareness about the nature of this type of ECO systems and professional support of experts in legal, accounting, banking issues, and Technical Advisors.
- **Human Capital**: means investing in human resources are both skilled or unskilled, to become dependable trained workers are familiar with 3DPT, and that transition should happen through educational institutions concerned of spreading awareness by education, training, human resources development, and leadership development, to increase the awareness of 3DPT capability and its usage and benefits.
- **Market System**: from local and international Enterprises that have production line intersected with 3DPT in order to make or develop a particular product and network that matter with all aspects of the market, also, customers who accept 3DPT by use product made from it, and adopt it in their works and Enterprises, and develop it by feedback from opinions, criticisms, and recommendations.

So, if the change going to happen in the ecosystem of Jordan to have an adoption of 3DPT, several steps need to activate in sequences and parallel sometimes, starting from creating an educational and cultural arm that comes with raising awareness of

3DPT, RM, and NPD in the parallel of that allocation of finance system to support and fund these initiatives and institutions. Then using these two steps to make pressure and motivate to the policymakers in order to lay down lists of laws, standards, limits, and regulations to organize this environment between all stakeholders in the ecosystem, so that could help the adoption of 3DPT in the society, which in turn will develop the technology and entrepreneurship ecosystem overall. After that, the coverage that comes from the laws with the opportunity that appears after developing the human resources and society to adopt this transform will help to create a culture based, and support system, that will courage the market mix from Enterprises and customers to deal and accept this adoption for 3DPT. Finally, after all of this effort, as a result of the development that occurs in the Jordanian ecosystem of entrepreneurship, this will impact the success or the entrepreneurial start-up success. The researcher reached to this conclusion after completing many brainstorming and interviews with several stakeholders in several institutions, initiatives, company, educational foundations, investment institutions, entrepreneurs, and some government organizations in Jordan.

3 The Study's Model and Research Hypotheses

Specific theories developed in the ground of Information Systems facilitate explicate how 3DP be able to contribute to business performance. Also, some researchers (e.g., Khorram & Nonino, 2017; Masa'deh et al., 2013; Masa'deh et al., 2014) argued that the notion of process virtualization assured that processes could be executed more efficiently as IT is performed to separate them from conventional physical or face to face methods. Also, based upon reviewing the related studies and literature and practical experience of the researchers (Khorram & Nonino, 2017; Martinsuo & Luomaranta, 2018; Masa'deh et al., 2018; Rylands et al., 2016; Schniederjans, 2017; Steenhuis & Pretorius, 2017), the study's model consists of two types of variables: independent variable (the extent of the adoption of 3DPT) and dependent variable (3DPT effectiveness indicators). Indeed, the research model for the current study was developed and proposed that the extent of 3DPT being used by entrepreneurial enterprises are positively likely to have a significant cause on their operational performance indicators in terms of time, cost, quality, competitiveness and management process.

In addition, three control variables were included to the research model: firm size (number of employees), firm experience (number of years from founding), and type of business. Firm size could be linked with a firm's ability to implement new technologies, such as 3DP. Also, firm size could be associated with the level of IT-manufacturing coordination required. In addition, in a very small firm, both functions possibly will exist in with the same people. Firm age could also be interrelated with the focal variables. Thus, in order to bring the distributions of these variables closer to being normally distributed, the logarithms of the numerical values were calculated.

The expected relationships between the independent and dependent variables were formulated in the following sub-hypotheses:

H1: The extent of the use of 3DPT applications directly and positively influences the perceived 3DPT effectiveness factors in SMEs' enterprises in Jordan.

H2: The extents of the use of 3DPT applications are differ amongst SME's enterprises due to their organizational demographic characteristics (type of business, size, and business experiences).

4 Research Methodology

4.1 Research Setting and Data Collection

The population of this study consists of small- medium sized industrial enterprises in Jordan, since the aim of the study is to examine the effect of the adoption of 3DPT on their operational effectiveness indicators: time, cost, quality, innovation, competitiveness, management process. Based on Ministry of Industry, the number of the actively registered small- medium sized industrial enterprises in Jordan is 4567 (Ministry of Industry Commerce, 2020). Because of the limited time and money, a connivance sample of 300 SME industrial enterprises located in Amman was selected for the purpose of this study. Taking this into account, a number of criteria were used to ensure that respondents were actually qualified to provide the information sought. The first criterion was that the enterprises they worked for should be engaged in developing products. The second criterion was that the enterprises should be actually used 3DPT. A total of 300 self-administered questionnaires were distributed to the respondents by e-mail and hand and the response rate was 72% (i.e., 216 respondents).

In this study, some variables are factual (for example Enterprises' profile such as type of SME enterprises, size, business experience, and type of the 3DPT applications), whereas others are perceptual (extent of the adoption of 3DPT application and type of operational effectiveness indicators: time, cost, quality, innovation, competitiveness and management). The extent of the adoption of 3DPT as well as the 3DPT effectiveness indicators were measured using Likert five-point scale, which ranged from 1 = strongly disagree, to five = strongly agree. The questionnaire contents were mainly selected from the previous studies (Khorram & Nonino, 2017; Martinsuo & Luomaranta, 2018; Rylands et al., 2016; Schniederjans, 2017; Steenhuis & Pretorius, 2017). For construct validation purpose, the questionnaire content was modified to the practice of Jordanian business context based on the results of a pilot study and feedback from five professional academic staff in this filed. However, the reliability of the study is tested by the Cronbach's Alpha coefficient. The value of Cronbach's alpha is found to be 0.87. It shows the stability and consistency of the scale are acceptable (Hair et al., 2010).

4.2 Respondents' Enterprises Profile

In this study, respondents' profile includes information about their characteristics such as: size, business experience, experience with the use of 3DP printing technology, the purpose of using 3DPT and the type of 3DPT applications. Table 1 summarizes the respondents' profile characteristics.

5 Data Analysis

The researchers tested the model adopting factor analysis and multiple regression analysis with the application of SPSS software version 25. The main rationale behind the use of factor analysis technique is to lessen the large number of variables that lie behind the perceived 3DPT effectiveness measures into orthogonal indices for additional analysis by the regression analysis.

Table 1 Respondents' enterprises profile

Respondents' characteristics	Frequency	Percent
Type of industry		
Automotive, Steel & Metal, Cement	46	0.21
Machinery, Power, Computer/Electronic	35	0.16
Automation, Plastics, Non-metallic Mineral	32	0.15
Food, Furniture, Wooden	47	0.22
Paper, Textile, Chemical	56	0.26
Business experience		
Less than 10 Years	86	0.40
15 Less than 20 years	78	0.36
More than 20 years	52	0.24
Number of employees (size)		
1–24 Employees	61	0.28
25–49 Employees	56	0.26
50–74 Employees	49	0.23
75–100 Employees	50	0.23
Experience with using 3DP applications		
1–5 years	121	0.56
5–10 years	68	0.31
More than 10 years	37	0.13

5.1 Validity and Reliability Test

By employing the principle component analysis techniques in order to explore the main patterns of factors that underlie these measures, the principle components analysis was used. It was considered an appropriate method to overcome the potential problems of multicollinearity among the variables that pertain to each construct. The results of the factor analysis were examined using multiple -criteria including, eigenvalues, interpretability, sampling adequacy (Kaiser–Meyer–Olkin measure > 0.5) and internal consistency, as recommended by Hair et al. (2010). Therefore, items with eigenvalues more than one and factor loadings less than (0.60) were determined. This means that the items had little or no relationship with each other; hence they were discarded (Hair et al., 2010). The results of the principle components analysis indicate that 6 factors can be extracted from 26 items. Cronbach's alpha reliabilities were also examined for each factor. Each coefficient greater than 0.40 for adapted and 0.70 for current scales was considered a reliable indicator of the constructs under study (Hair et al., 2010). Reliability analysis was carried out for each factor and the results score ranged from 0.85 to 0.91 as shown in Table 2. In summary, based on the preliminary analysis, the evaluation of the data by factor analysis and reliability estimates indicated that all scale items were appropriate and valid for further statistical analysis.

The results of the principal component analysis Table 4 indicate that six significant factors can be extracted from the 3DPT effectiveness measures. This construct composed of (26) items (variables) as presented in Table 2. The first factor, which accounts for (20.120%) of the variance with loadings ranging from 0.72 to 0.84, can be identified as a "Cost factor". The second factor, which explains 18.342% of variance with loadings range from 0.71 to 0.81, could be labelled as "Time" factor. The third factor which accounts for (15.121) can be identified as "Quality" factor and the fourth factor which account for (11.231) can be labelled as "Innovation" factor. The fifth factor can be named which account for 8.652 as "Competitiveness" factor and the sixth factor which account for 4.521can be called as "Management" factor. The combinations of these factors account for 78.987 of the total variances in the questionnaire data as can be shown in Table 3.

Table 2 A summary results of the principle component analysis

Factors	No. of items	Eigen-value	% of variance	Cumulative %
Cost	6	5.245	21.120	20.120
Time	4	5.177	18.342	39.462
Quality	5	4.793	15.121	54.583
Innovation	3	3.671	11.231	65.814
Competitiveness	3	2.345	8.652	74.466
Management	5	1.670	4.521	78.987

Table 3 Main factors underlying the perceived effectiveness of 3DPT

Code	Items (Variables)	Loadings	Communality
	Factor 1 cost		
C3	3D printing technology has minimized the product development cost	0.84	0.87
C4	3D printing technology has minimized the cost of maintenance	0.80	0.85
C2	3D printing technology has minimized the cost of tool for prototyping	0.77	0.82
C1	3D printing technology has minimized the cost of raw material	0.75	0.78
C6	3D printing technology has minimized the cost for transportation and delivery	0.73	0.76
C5	3D printing technology has reduced the cost of labor (workers)	0.72	0.74
	Factor 2 time		
T3	3D printing technology has minimized the time needed for prototyping cycle	0.81	0.85
T4	3D printing technology has minimized the time needed for production cycle	o.76	0.80
T1	3D printing technology has minimized the lead time	0.74	0.77
T2	3D printing technology has speeded time-to-market	0.71	0.76
	Factor 3 quality		
Q4	3D printing technology has increased the use of a new way to form materials for productions (e.g., Laser, UV, and Electric Beam)	0.78	0.81
Q5	3D printing technology has invented a new ability to get different properties of materials	0.75	0.77
Q3	3D printing technology has enhanced the optimization designs	0.72	0.78
Q2	3D printing technology has enhanced the precision and accuracy of the products output	0.69	0.74
Q1	3D printing technology has minimized the number of assembled components for products	0.67	0.76
	Factor 4 innovations		
N3	We played a leading role in market activities in our market	0.74	0.77
N2	We introduced more new products/services on the market than our competitors	0.67	0.69
N1	We adopted more technological innovations than our competitors	0.66	0.68
	Factor 5 competitiveness		

(continued)

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Table 3 (continued)

Code	Items (Variables)	Loadings	Communality
O1	3D printing technology has improved our competitiveness capabilities	0.76	0.84
O3	3D printing technology has seriously improved our company's market positioning	0.71	0.75
O2	3D printing technology has speeded overall business operations more effectively better than our competitors	0.64	0.68
	Factor 6 management		
M4	3D printing technology has improved the management style and planning process of our company	0.75	0.79
M2	3D printing technology has decreased the risks in the decision-making process	0.68	0.76
M5	3D Printing technology has increased the privacy and security of new products in early stages	0/66	0.74
M3	3D printing technology has increased the health and safety standard in our company (smells, heats, noise)	0.64	0.68
M1	3D printing technology gives our employees greater control over their work	0.61	0.67

Table 4 The extent of the use of 3DP printing applications

No	Variables	Mean	%	Standard deviation	Sig. (2-tailed)
1	The company is fully integrated 3D printing technology in its business plan operations	3.781	0.7562	0.82783	0.000
2	The company has invested completely in IT infrastructure to adopt 3D printing technology	3.653	0.7306	0.8053	0.000
3	The company has 3DPT experts available to fully deploy 3D printing technology	3.681	0.7362	0.76469	0.000
4	The company top management is fully supported the decision to adopt 3D printing technology	3.541	0.7082	0.85610	0.000
5	The company has adopted 3D printing Technology in its manufacturing operations completely	3.432	0.6870	0.83426	0000
	Average practice	3.617	0.7235	0.75279	0.000

5.2 The Extent of the Use of 3DPT by SME in Jordan

The mean values, standard deviation and T-test are employed here to determine whether the 3DP printing applications are used by SMEs in Jordan. Finding shown in Table 4 indicate that the extent of 3DPT application being practiced by SME is conserved to be good (i.e., 72% or 3.61), since their mean are more than the mean of the scale, which is 3 (mean of the scale = Σ Degrees of the scale 5 = 1 + 2 + 3 + 4 + 5/5 = 3). This implies that there are some variations among SME in terms of their extent of use of 3DPT printing applications.

5.3 Hypotheses Testing Results

5.3.1 Testing the Relationship Between the Extent Use of 3DPT and the Perceived Effectiveness of 3DPT by SMEs in Jordan

The multiple regression analysis technique is used to examine the first hypothesis. Table 5 summarizes the results of multiple regression analysis, with the F-ratio test, for the study hypotheses (H1). The results indicate that there is a significant relationship between the extent of use of 3DPT applications and the perceived effectiveness of 3DPT factors at 0.000 level of significant. This result empirically proved that the extent of use of 3DPT has a positive and a significant impact on the perceived effectiveness of 3DPT. Accordingly, it may be concluded that the higher is extent use of 3DPT applications, the higher is the perceived effectiveness of 3DPT factors.

In order to determine the most important of perceived operational effectiveness of 3DPT factors which highly correlated with the use of 3DPT, the stepwise regression analysis was employed. The F value at (0.00) level of significance is used to determine the "goodness of fit" for the regression equation as well as the beta coefficient. The results of the beta coefficients in Table 6 indicate that the most important operational effectiveness factors indicators that highly associated with the use of 3DPT are four factors, namely and in order of the importance: cost, time, quality and innovations. It can be concluded that the higher the use of the 3DPT, the higher will be those operational effectiveness indicators, i.e., cost, time, quality and innovations indicators. Therefore, SMEs should be fully utilized and ingrate the 3DPT in their business process in order to enhance these operational effectiveness measures more effectively. However, the competitiveness and management effectiveness factors were found insignificantly related to the use of 3DPT. These results might be due to the

Table 5 Multiple regression for the (H1) hypothesis

Hypothesis	Multiple R	R. Square	Adjusted R Square	DF	F	Sign
Ho1	0.776	0.602	0.602	6	10.632	0.000

Table 6 Stepwise regression analysis results

Indictors	Step	R	R Square	Adjusted R Square	Beta	Sig
Cost	1	0.512	0.262	0.250	0.470	0.000
Time	2	0.556	0.314	0.308	0.366	0.000
Quality	3	0.590	0.348	0.331	0.238	0.000
Innovations	4	0.602	0.362	0.351	0.196	0.000

fact that management and competitiveness are long-term strategic effectiveness indicators, and as the majority of SMEs in Jordan have recently just adopted 3DPT applications on their business process, they may not yet grasp this other positive effectiveness of using 3DPT.

5.3.2 Testing the Variation on the Extent of Using 3DPT Application Based on the SMEs' Demographic Attributes

The ANOVA analysis technique is also used to examine the 2nd hypotheses (H2). To assess the differences among SMEs in terms of the extent of the use of 3DPT based on their organization's demographic characteristics such as size, type of business and business experience (age). As it is shown in Table 7, the results indicated that there was no variation among SMEs using 3DPT applications in terms of their types of industrial sector and business experience, while there was a significant difference amongst them in terms of their size of business. It may be concluded that type of SMEs and their business experience did not have any influence upon on their extent of using 3DPT applications while their business size has an important role in this respect. This result might be due to the fact that the larger size of company, the more ability to invest in the adoption of IT.

Table 7 The significance of the extent of using 3DPT among groups of SMEs base on their demographic attributes (type, experience and size)

Attributes		Sum of squares	df	Mean Square	F	Sig
Type	Between groups	0.170	4	0.085	0.124	0.884
	Within groups	167.660	212	0.687		
	Total	167.830	216			
Experience	Between groups	0.194	2	0.097	0.106	0.900
	Within groups	223.329	214	0.915		
	Total	223.522	216			
Size	Between groups	22.127	3	7.376	10.091	0.000
	Within groups	177.614	213	0.731		
	Total	199.741	216			

6 Discussions and Conclusion

The purpose of this study was to examine the effectiveness of using 3DPT applications by SMEs in Jordan and to determine whether using 3DPT among them differ in terms of their organizational demographic characteristics (type, experience and size). In order to achieve the study objectives, and to conduct the research using a systematic approach, hypotheses were developed and tested. The results of using factor analysis indicated that 26 items of effectiveness measures of 3DPT can be grouped into six orthogonal factors, namely; cost, time, quality, innovation, competitiveness and management. These patterns of factors are supported by previous studies (Martinsuo & Luomaranta, 2018; Schniederjans, 2017; Westerweel et al., 2019).

The findings also indicated that the extent of the 3DPT applications being used by SMEs was considered good (0.72). This result is reinforced by prior studies such as those by Martinsuo and Luomaranta (2018), Rylands et al. (2016), Khorram and Nonino (2017), Steenhuis and Pretorius (2017). The potential benefits of the adoption of 3DPT applications to SME include developing their competitiveness, in changes occurred at cost, time, and quality for their products, and management process. The analysis also provides empirical evidence regarding the effectiveness using 3DPT by SMEs as suggested in the first hypothesis (H1). The results have supported empirically the linkage between 3DPT utilization and the perceived operational effectiveness factors. The results also suggest that about 35% of the variation on the operational effectiveness factors s could be explained by the 3DPT being used by SMEs. This result is supported by Schniederjans (2017), Steenhuis and Pretorius (2017). Also, the stepwise regression analysis results indicated that the most important operational effectiveness factors that highly associated with using 3DPT were cost time, quality and innovation. Therefore, the managers of SMEs should be fully utilizing and ingrate the 3DPT in their business process in order to improve their operational effectiveness performance more effectively, particularly time, cost, quality and innovation measures.

Based on the above results, it is worthy to argue that digital technologies like 3DPT can be correlated to innovation performance in several ways. Conducting business processes digitally would advance efficiency and assist in coping with uncertainty (Lu & Ramamurthy, 2011; Mishra et al., 2013; Qian, 2020). Also, IT assists in coordinating and synchronizing business functions like innovation and product manufacturing (Bharadwaj et al., 2007). Innovation is an information prosperous activity, which benefits from the exploitation of IT to harmonize and deal with digital data, for instance offering access to information to all those concerned in a project. By assembly the innovation process more digital, 3DP be able to assist designers to distribute information at early stages of idea development, to rapidly examine working prototypes and allocate them with engineers in the development stage and to correspond to customers' requirements using physical models to extract customer inputs or during product commence (Jong & Bruijn, 2013).

Also, adoption of digital tools in innovation be able to assist firms attain thriving outcomes from innovation projects (Marion et al., 2015; Shannak et al., 2010; Tarhini

et al., 2015). The association between elastic manufacturing systems, such as 3DP, and product innovation is a rational one, which has also been tested (Oke, 2013). Consequently, the commence of 3DP is likely to be related with superior innovation performance. A specific concern for innovation is the incorporation between innovation and manufacturing, as the ability to develop successful products entails both (Thompson et al., 2016). Innovation is gradually more reliant on the utilize of digital design tools, which in turn depend on the accessibility of appropriate IT infrastructures (Marion et al., 2015). This is reliable with the growing acknowledgment that IT should have a strategic rather than supporting part in business (Bharadwaj et al., 2007).

Furthermore, the results of the 2nd hypotheses testing revealed that the variation of using 3DPT applications among SMEs in Jordan could be mainly due to their size but not their type of business sector and experience This might be due the fact that more than half of target respondents (i.e., about 51% less than 5 years, Table (1) have just recently adopted the 3DPT and they were still in the early stage of the adoption, therefore, this short time of experience might not enough for the majority of them to take advantages of the potential benefits and opportunities using 3DPT application in their operational process.

6.1 Theoretical and Managerial Implications

The theoretical implications of this study are fourfold: first, the findings of this study contribute to literature on 3DPT utilizations which can be used to improve operational effectiveness of SMEs. Second, this study contributed to the 3DPT literature by identifying and examined six operational effectiveness factors measures of using 3DPT for the first time in Jordanian business context as a developing country. The present study has important implications for SMEs managers in the surveyed companies and in similar organizations. The authors believe that the decision-makers of these companies could benefit from this study's findings with a better understanding of potential benefits of using 3DPY on their business process.

Furthermore, the results of this study can aid managers in comprehending how 3DPT can improve operating process effectiveness and business performance. Managers or owners of SMEs could search for and adopt tools that can increase the use of 3DPT applications if they want to improve their operational effectiveness performances. Also, they should be fully aware of the importance of the effect of 3DPT applications on their operating process and business performances, so that they could make the appropriate change within their organizations. Second, the role of 3DPT applications to enhance company's operational effectiveness process should be considered in strategic choices for the future at every organization.

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Development of Market Analysis Study in Aqaba

Ali S. Hyasat and Ra'ed Masa'deh

Abstract This study aimed to understand the current conditions of the tourism product as well as tourist perceptions in Aqaba City. A quantitative approach methodology was developed to meet the research aims and objectives. The quantitative technique was used based upon the opinion of tourists who visited Aqaba to understand the current condition of tourism products and tourist perceptions. The result indicated that most of the tourists complained about the transportation and traffic. Therefore, there is a need for local institutions to overcome this problem by facilitating access to important tourist attractions areas. Moreover, these institutions should give more attention to the cleanliness issue in Aqaba. Tourists also indicated that Aqaba lacks good restaurants to use or café to enjoy in the city. This indicates that existing places are all popular initiating the need to construct new places with suitable entertainment for tourists. Aqaba Special Economic Zone (ASEZA) should encourage the private sector to establish more cafés, restaurants, and other facilities in Aqaba. Moreover, public institutions should control prices, as tourists complained about the manipulation of prices, especially with tourists using their ignorance of prices. Another weak element was raised by tourists is the poor activities included in the tourist programs in Aqaba. Tourists who visited Aqaba felt boring in particular during night times due to the poor program. The tourists expected to see the city with a wide range of tourist activities distributed in different places. Authorities and policymakers in Aqaba should create a suitable and enjoyable activates program for tourists. The study also recommended that tourism in Aqaba should be marketing along with Petra and Wadi Ram as standalone destinations. Furthermore, tourism in Aqaba needs a special

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_33

Beach Management Board, which should be responsible for all tourism activities on the beach of Aqaba.

Keywords Market analysis · Tourism product · Tourist · Aqaba · Jordan

1 Introduction and Background

Tourism continues to grow fast, exceeding expectations despite the economic crises and geopolitical conflicts in many regions around the world. This growth has deepened the diversification of tourism offerings to become one of the fastest-growing economic sectors in the world (Alaali et al., 2021; ASEZA, 2015; EDP, 2011–2013). The UNWTO promotes tourism as a vehicle for economic development, social inclusion, and sustainable environmental development. The UNWTO recognized tourism for its ability to enhance peace between nations, create jobs, varied employment opportunities through youth and women inclusion in the host local communities, and contribute to poverty elevation, social development, cultural diversity, and a sustainable environment. Meanwhile, the UNWTO emphasizes the shared global responsibilities by tourism sector stakeholders in local communities to achieve sustainable tourism development in destinations (UNESCO, 2015; USAID, 2009).

In Jordan, tourism is a key driver of the national economy, it is the single largest employer, and the highest generator of foreign exchange. The potential for economic and social development stemming from tourism is high, particularly because Jordan has world-class historic and religious sites, fascinating cultural heritage, and stunning natural landscapes, including six UNESCO World Heritage sites. Tourism accounts for 13% of the Kingdom's income generation; it is a fundamental organ of employment operations and a vital contributor to the national economy. According to the Jordan National Tourism Strategy (JNTS), about 50,000 people were directly employed in the tourism sector. It is believed that employment generated by the indirect economic impact of tourism is several times greater than the direct employment generated. The Government of Jordan, through the execution of its Executive Development Program 2011–2013 (EDP), is trying to strengthen the competitiveness of the tourism industry by developing and diversifying tourism products, improving the quality of tourism services, exploring new markets, and increasing tourism-related investment. The Jordanian Ministry of Tourism and Antiquities (MoTA) is working on comprehensive tourism development through a public–private partnership to increase tourism revenues (Abu Zayyad et al., 2021; Alananzeh et al., 2018; Aljumah et al., 2021; Alshurideh et al., 2015; JDS, 2014; JNTS, 2010a, b; MOTA, 2011).

However, despite its advantages and its importance to the economy, Jordan's tourism sector was performing at a level far below its potential. Many factors contributed to lower visitor spending per arrival compared to the world average and some of Jordan's closest competitors (Egypt and Lebanon for example) (Deeb et al., 2020; European Union Development Programme (IS-ASEZA), 2005; Hamadneh

et al., 2021), this disparity was largely due but not limited to three main reasons: The short length of stay, low visitor expenditure per day, and un-coordinated visitor servicing after arrival in Jordan.

According to the classification of the MoTA, tourist attraction resources in Jordan were divided into three main types in Jordan. These are historical and Cultural Heritage Sites., Natural Sites, and Medical Sites (Getz, 1997; Goldman et al., 1997; Jawabreh et al., 2020; Kamakura et al., 1991; Khwaldeh et al., 2020; Kim & Mauborgne, 1993; Kotler & Armstrong, 2007; Kotler et al., 2010; Lovelock et al., 2004; Luo, 2002). Under each type, there are several sites and tourist attractions including tourist services and facilities. As one of the major tourist sites in Jordan, Aqaba has the base ingredients for tourism success. In addition to its beautiful underwater environment and excellent climate, it has, unlike other Red Sea Resorts, its history, heritage, and character. Moreover, it benefits from proximity to a world-famous attraction—Petra—and to the desert splendor of Wadi Rum (Masa'deh et al., 2017, 2018, 2019; McDonald, 1999).

Aqaba, however, faces a difficult marketing environment. Worldwide economic and political problems have severely impacted the international tourism industry. Competition, particularly from other Red Sea resorts and also from Lebanon and Turkey, has intensified; earnings are under pressure. A further planned expansion of hotel rooms in Aqaba could damage occupancy and profitability unless strong and targeted marketing can deliver vigorous growth over the next five years. However, if Aqaba takes the necessary steps to improve its accessibility, enrich its product, strengthen its brand differentiation, and professionalize its marketing, then there is no reason why the spectacular success achieved in attracting resort investment cannot be matched in the future by the overall health of its incoming tourism industry (Ritchie & Crouch, 2003; Sweiss et al., 2021).

Aqaba has hitherto been held back by lack of accommodation capacity, but this phase is coming to a rapid end. Aqaba now urgently needs to improve its marketing performance (Tariq et al., 2022). According to the JNTS, Aqaba should improve and diversify its product offer, especially in the historic city center—visitors must be given good reasons to stay longer and spend more and to build demand. Both of these elements are vital to successful marketing, which needs to embrace the full cycle from research and product development through to promotion, with research then feeding back into product development and modification.

In conclusion, there was still some lack in analyzing and discussing all aspects of tourism in Aqaba to spot the light on the tourism market in Aqaba, therefore, this study was prepared to fill this gap (Hyasat et al., 2022). This study was conducted to understand the current condition of tourism products in Aqaba and tourist perceptions toward the City.

1.1 Materials and Methods

As previously mentioned, the main aims for this study were to understand the current conditions of the tourism product as well as tourist perceptions in Aqaba City through the following objectives:

- To identify the profile of tourists and their visits overview.
- To classify the type of activities and the amount of expenditure.
- To identify the perception of Aqaba (satisfaction and problems).

The study was based on applying quantitative research methodology. A quantitative method was used to meet the main aim and objectives for the survey based on developing a questionnaire that targeted tourists who visited Aqaba, to have a general understanding of their opinion about tourism in Aqaba and their state of participation. Questions were asked to tourists who visited Aqaba about their visits, activities, and amount of expenditure, whether their visit was arranged by a travel agency or individually carried out, and their perception of Aqaba, satisfaction, and problems. By using a random sample technique, the researchers distributed questionnaires to tourists, (105) out of those questionnaires have been filled up by tourists and collected by the researchers. However, the researchers found that there were only (80) questionnaires filled up properly in a reliable manner which enabled the researchers to conduct the research. According to researchers, the use of a questionnaire could contribute to mutual method prejudice; on the other hand, others stated that the reality of common method bias in self-reported surveys is unfounded (Podsakoff et al., 2003; Spector, 2006). To avoid this concern, the researchers ensured a rigorous methodology. A pilot study was used to address the concern. Moreover, the literature review, statistical data, and all documents about tourists and tourism in Aqaba have been collected by the researchers from the official institutions in Aqaba.

The list of samples was based on the random sampling technique. To ensure that the questionnaire reached most tourists from different nationally the questionnaire was distributed in most of the sites and tourists' attractions in Aqaba, which were expected to be seen by most of the tourists who visited Aqaba.

The researchers ensured the balanced rating scales to reduce the effect of bias. Descriptive analysis was then used to analyze the data. Data analysis included frequencies, percentages, means, and ranking of the results. The data was reflected on answering the fundamental questions of the research for the questionnaire, and it was analyzed to achieve the aims and objectives of this study. After analyzing the data collected for the survey, this study produced a framework of tourism-related business and tourist participation in Aqaba City. Some important factors such as a profile of the tourist, overview of the visit, types of activities, and any arrangements by travel agencies have been examined. Having presented the data, the researchers conducted a SWOT analysis to identify all strengths, weaknesses, opportunities, and threats points of the tourism market in Aqaba.

2 Data Presentation and Analysis

2.1 Sample Characteristics

The sample covered composed of a wide variety of nationalities. The highest number of tourists was from Russia with a percentage of 20.0%, followed by Italian tourists with a percentage of 15.0%. The medium percentage was recorded for German, French, American, and Sweden with percentages ranging from 6 to 8%. About 4% of the sample was recorded for Australian, Spanish, and Jordanian, while the lowest was recorded for Ukraine, Japan, Iraq, Israel, and UK (Table 1).

The majority of the sample was males with a percentage of 56.4%, while females composed 43.6%. The majority of sample ages ranged from 31–50 years with a percentage reaching 65.8% of the sample. The younger tourists formed about 21.1% of the sample, while the older tourists formed only 13.2% (Fig. 1).

Table 1 Sample structure

Nationality	Frequency	Percent
Russian	16	20.0
Italian	12	15.0
German	8	10.0
French	8	10.0
American	6	7.5
Sweden	6	7.5
Australian	4	5.0
Spanish	4	5.0
Jordanian	4	5.0
Hungarian	2	2.5
Okrine	2	2.5
Japan	2	2.5
UK	2	2.5
Iraq	2	2.5
Israel	2	2.5
Total	80	100.0

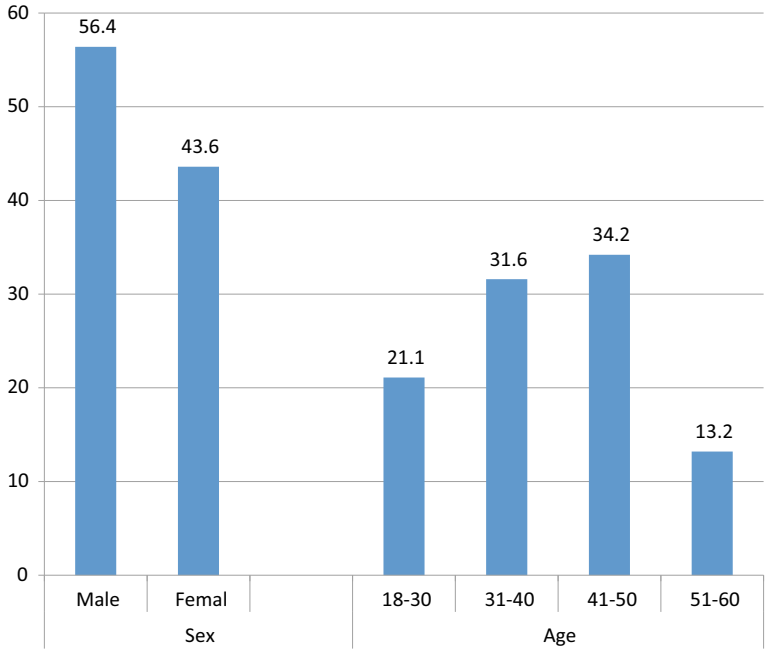

Fig. 1 Characteristics of sample tourists

2.2 Visit Overview

2.2.1 The Time of Stay in Aqaba

The majority of the sample spend two to three days in Aqaba with a percentage of 55.0%, while the number of tourists who spend more than three days was 42.5%, the lowest percentage of visitors stay for one day or less (Fig. 2). Most tourists accompanied husband/wife with a percentage of 42.5%, followed by a friend with a percentage of 25.0%. About 15.0% of tourists did not have any company in their visit to Aqaba. The least percentages had colleagues or family members as a company during their visit to Aqaba (Fig. 2).

2.2.2 Method of Transportation

Tour buses were the dominant used as a method of transportation (30.0%). The rented cars were the second method of transportation used to get to Aqaba followed by the usage of both private or rental cars and the same time using taxi and tour buses through their visit to Aqaba with percentages 22.5% and 20.0% respectively. The fourth tool used the use of a private car with a percentage of 12.5%. The same and

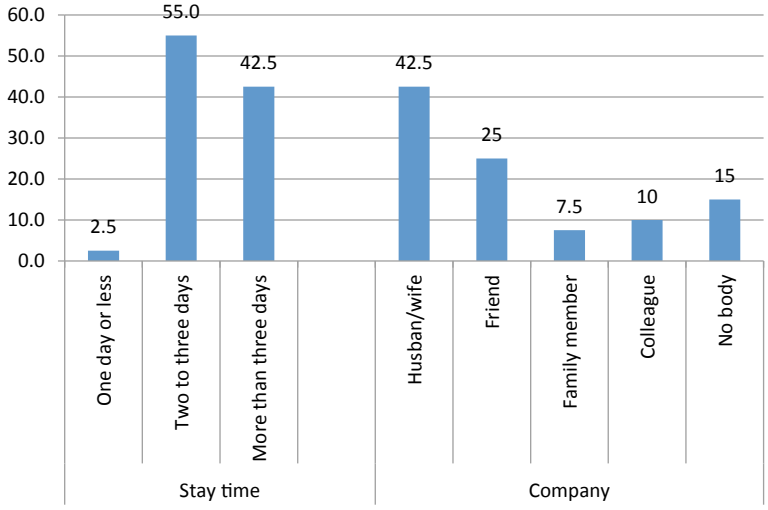

Fig. 2 Time of stay and tourist company

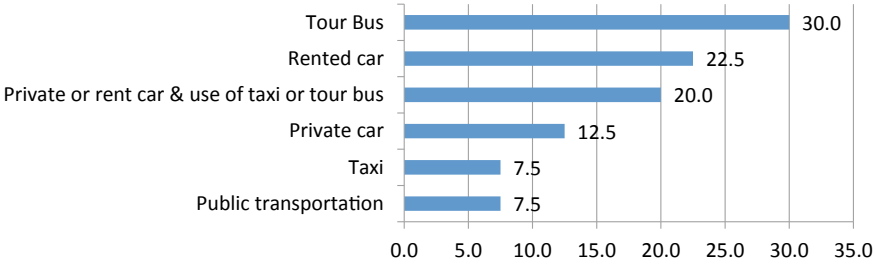

Fig. 3 Method of transportation

least percentage was recorded for Taxi and public transportation with a percentage of 7.5% (Fig. 3).

2.2.3 Causes of Choosing Aqaba

Means calculation was used to evaluate the rank of different causes of choosing Aqaba indicating that 5 is the highest rank and 1 is the lowest rank. The results in Fig. 4 show that break out of the routine and relaxation with a mean of 4.38 was the cause of selecting Aqaba. The second factor that affect the selection of Aqaba listed was the local product (Food and beverages) with a mean of 4.09. Meeting new people was ranked as a third cause of selecting Aqaba with a mean of 4.08 and curiosity about places/events unknown and unseen places was the fourth cause with a mean of 4.03. The causes living strong emotion and addictive, share the experience with

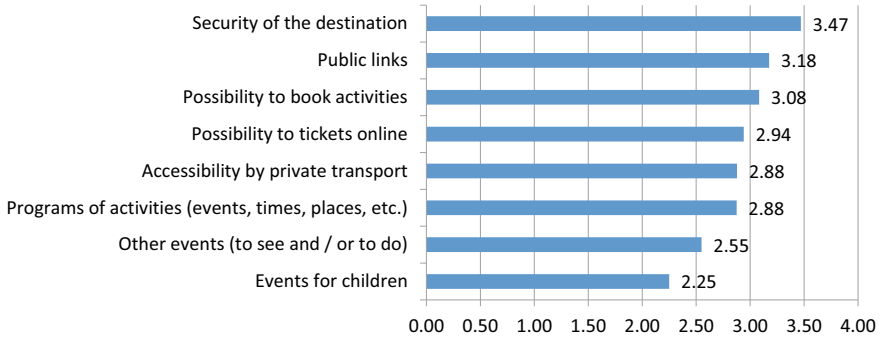

Fig. 4 Causes of visiting Aqaba

family and friends, visit a natural environment, buy local products or craft, visiting the museum, and churches, and the contribution of initiatives of the local community had means ranged 3.88, 3.81, 3.69, 3.63, 3.50 and 3.34 respectively. The least value was given for playing outdoor sports with a mean of 2.93 (Fig. 4).

2.2.4 Rating Quality

The first quality priority for visitors was given for the security of destination with a mean of 3.47 followed by public links with a mean of 3.18. The third rank was given for the possibility to book activities with a mean of 3.08. The evaluation of the possibility to book tickets online, accessibility by private transport, program activities, other events, and events for children was negatively evaluated (Fig. 5).

2.2.5 The Type of Accommodation Selected

Most of the sample indicated that they used hotels during their stay in Aqaba. The highest proportion used four starts and five starts hotels with a percentage 46.2% for each and only 7.7% used three start hotels. Only 2.5% of the sample stayed with their relatives or friend during their stay in Aqaba (Fig. 6).

2.2.6 Knowing About Aqaba

The majority of the sample (39.0%) knows about Aqaba through travel agents, followed by friends and family with a percentage of 26.3%. The guidebook was the third source of knowledge about Aqaba with a percentage of 13.6%. The rest of the methods of knowing about Aqaba were distributed according to their importance among websites (11.0%), visitors center in Amman (5.1%), brochures at hotels (3.4%), and other methods (1.7%) (Fig. 7).

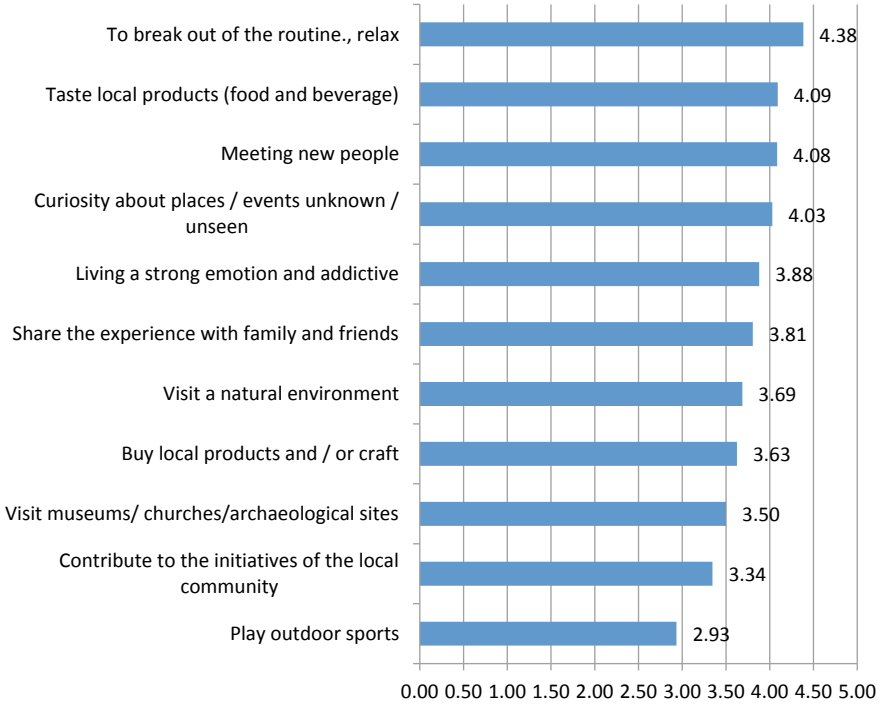

Fig. 5 Rating quality of different facilities

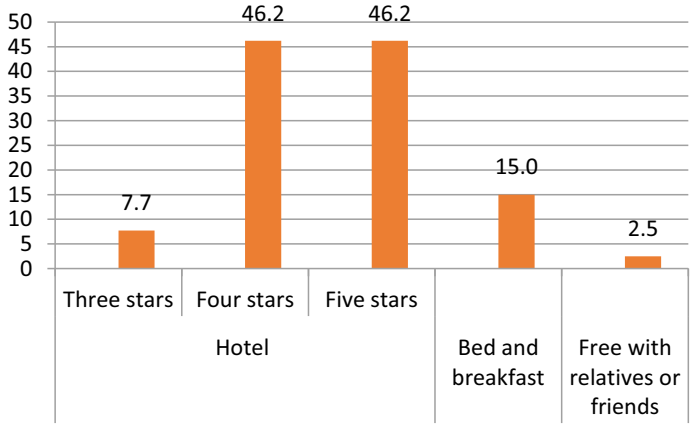

Fig. 6 Type of accommodation selected

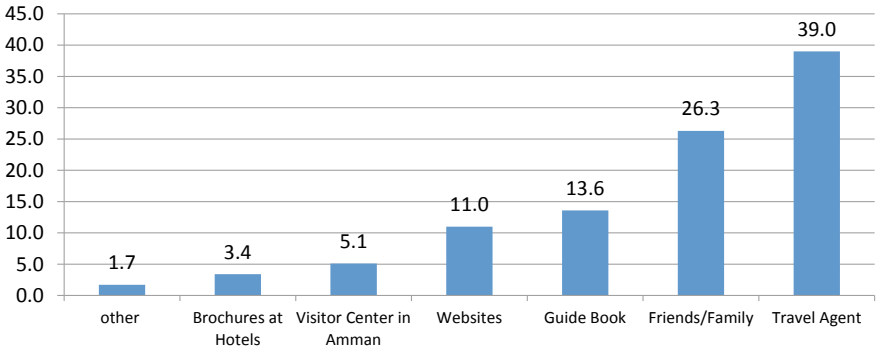

Fig. 7 Method of knowing about Aqaba

2.2.7 Type of Activities and Amount of Expenditure

The highest practiced activity in Aqaba by tourists was eating local food and having drinks with a percentage of 18.7% followed by diving with a percentage of 16.3%. Shopping was the third activity practiced by tourists with a percentage of 15.4%, followed by buying souvenirs (10.6%). Visiting parks and nature attraction places in Aqaba was practiced by 9.8% of tourists. Boat tours and water sports were practiced by 8.9%. Communication with local people, visiting historic sites, living nightlife, other activities, and visiting family relatives and friend house was activities practiced by tourists with low percentages (Fig. 8).

2.2.8 Expenditures in Aqaba

The expenses of tourists on different activities varied according to activity and the trip arrangements of tourists. For transportation, the highest percentage of tourists expended $1–50, followed by the $151–200 category. The results indicated that the expenses on transportation depend on the plans of the trip introduced for tourists.

Concerning food and drinks, the majority of tourist expenses ranged from $51–100 followed by $1–50 with percentages of 38.5 and 34.6% respectively. This indicates that the majority of tourist food coverage is planned with the trip itself. The expense for a guide was ranging from $1–50 per tourist with a percentage of 60.0%. Expenses on souvenirs varied among tourists. The highest expenses ranged from $101–150 with a percentage of 25.0%, while the rest were distributed on different categories almost equally. Most of the sample paid entrance fees ranging from $101–150 (see Figs. 9, 10, 11, 12, 13 and 14).

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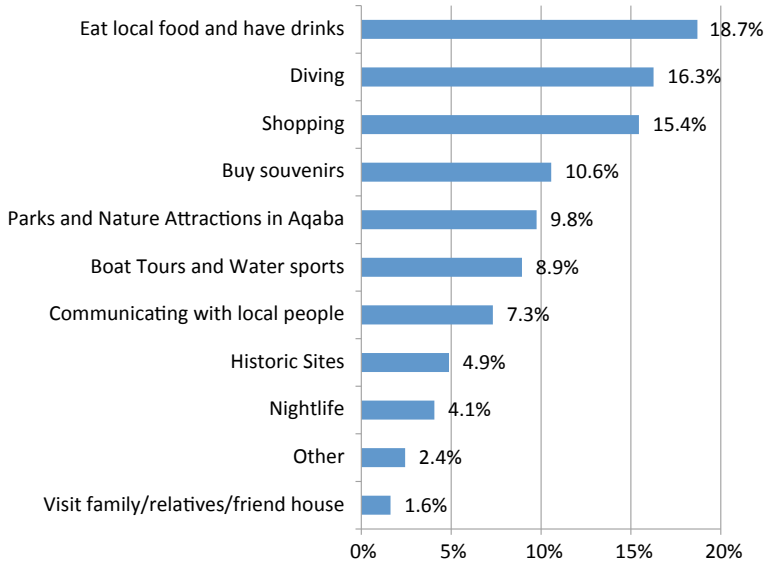
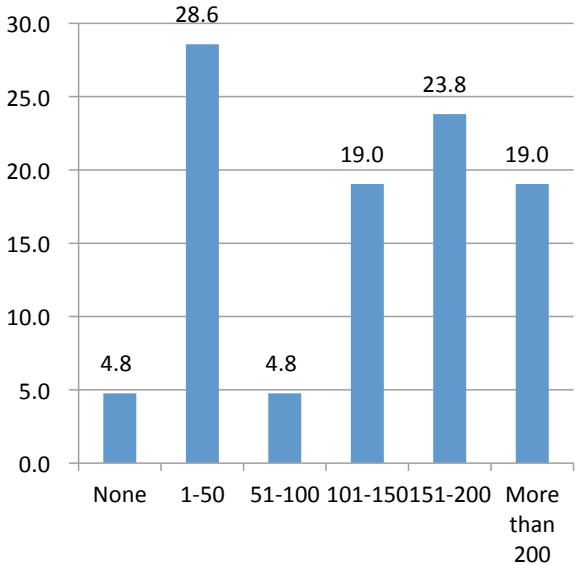


Fig. 8 Type of activities practiced in Aqaba by tourists

Fig. 9 Transportation



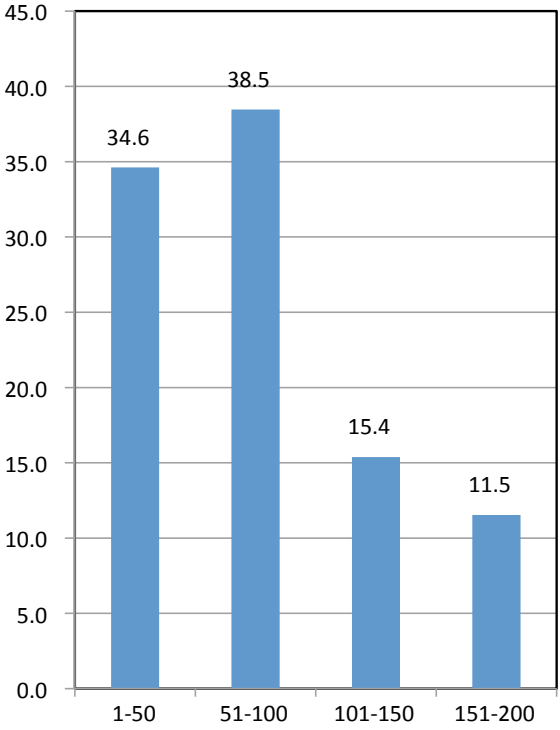


Fig. 10 Food and drinks

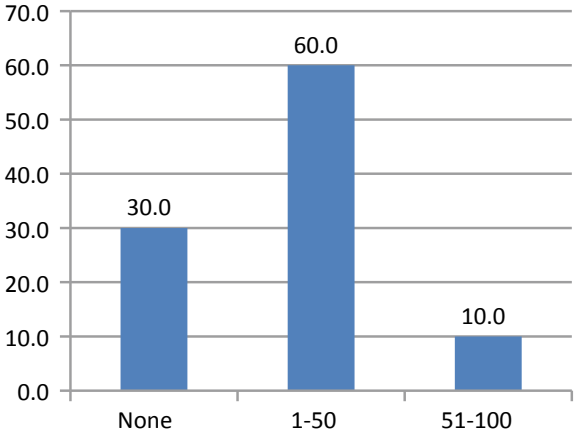


Fig. 11 Guide

2.2.9 Arrangement by a Travel Agency

The visit for the majority of tourists was arranged by a travel agent with a percentage of 74.4%. This indicates that the majority of tourists are committed to the travel

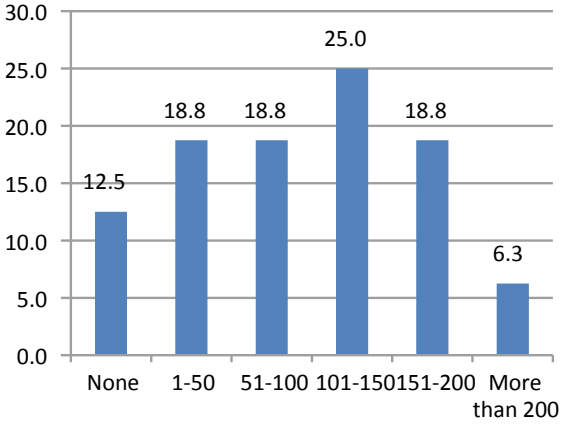


Fig. 12 Souvenir

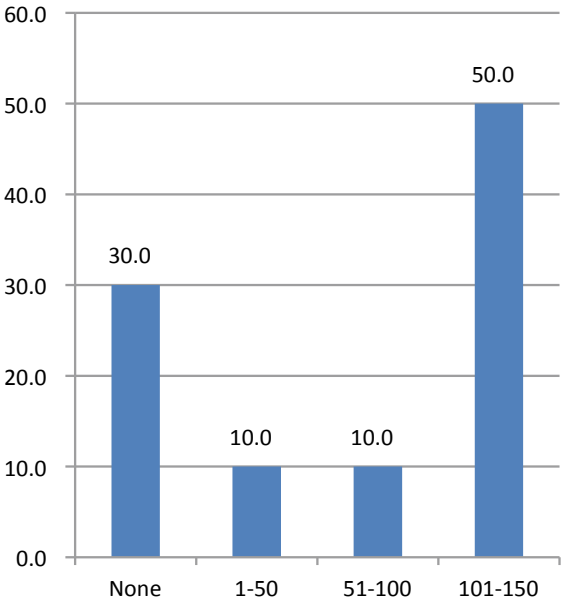


Fig. 13 Entrance fees

agent's plans to visit Aqaba. About 62.5% of the tourists indicated that other places are planned for a visit besides Aqaba (Fig. 15).

2.2.10 The Destinations Included in the Package

The first four places included in the package were Petra, the Dead Sea, Wadi Rum, and Mount Nebo with percentages of 23.0, 21.8, 19.5, and 12.6% respectively. The

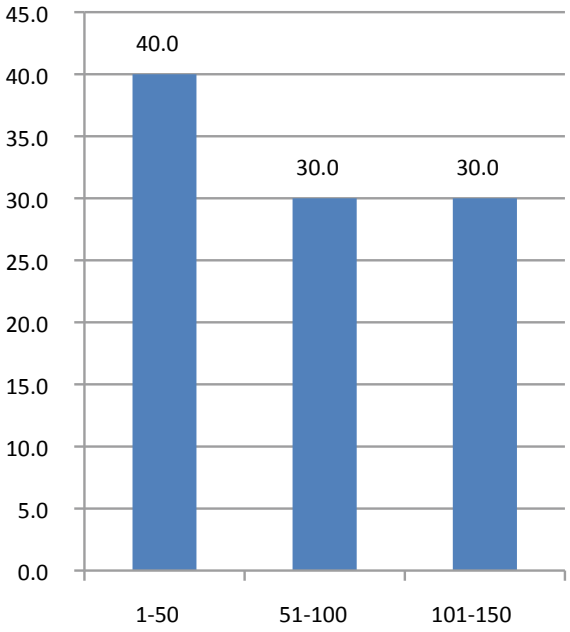


Fig. 14 Other

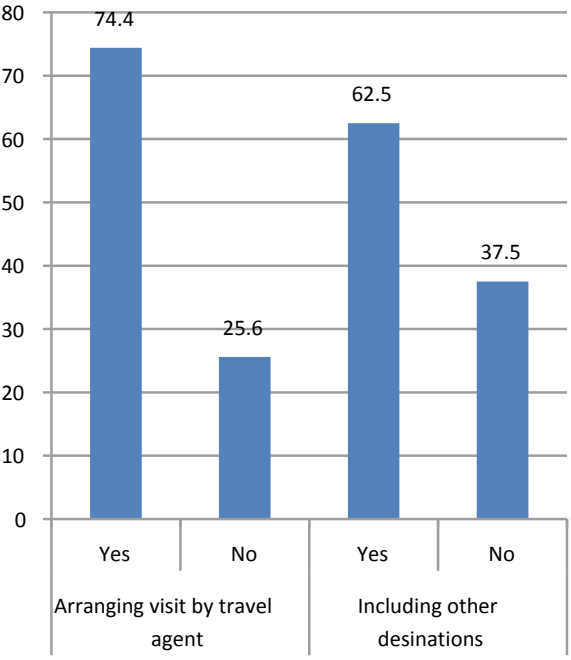


Fig. 15 The responsibility of arranging aqaba visit and including other destinations

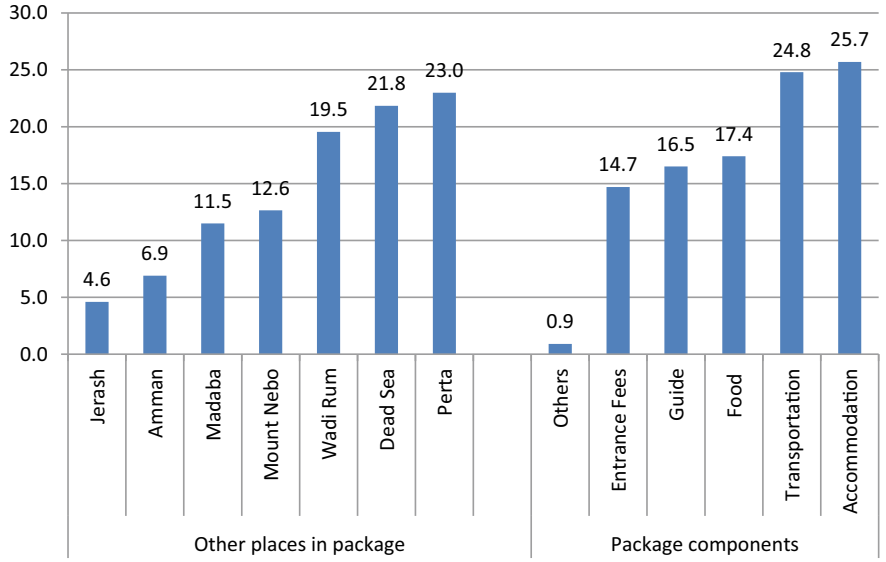


Fig. 16 Other places in package and its components

reset of places distributed on Madaba, Amman, and Jerash. The package included the accommodation with percentage 25.7%, transportation with percentage 24.8%, food (17.4%), guide (16.5%), and entrance fees (14.7%), (Fig. 16).

2.2.11 Average Expenses Paid

The average total expenses paid was $1675.3 with a standard deviation of 1188.97 indicating that there is a wide variation of the totals paid in visiting Aqaba. The high variation has resulted from the different sources of tourists included in the sample. The minimum expense was $204.55 while the highest recorded was $5000.

2.2.12 Perception of Aqaba (Satisfaction, Problems)

Expectations of Visiting Aqaba

The results showed positive attitudes of the sample for visiting Aqaba. The results showed that 41.0% of the sample was more than their expectation, while 48.7% were fulfilled in their visit. The results also showed that only 10.3% were partially fulfilled (Fig. 17).

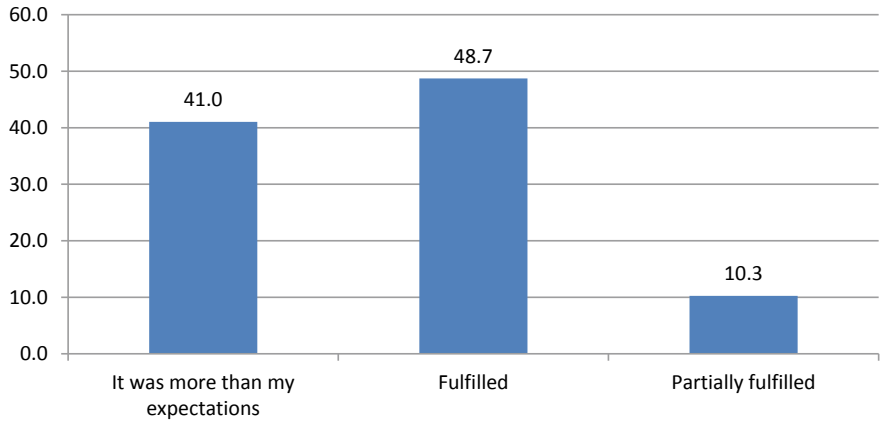


Fig. 17 The expectations of visiting Aqaba

The Difficulties Faced Tourists During Visiting Aqaba

The garbage and bad traffic were the first two difficulties faced tourists during their visit with a percentage of 24.5% for each. Poor and insufficient services were in the third rank with a percentage of 13.2%. Boring and no information for tourists were two difficulties faced by tourists with a percentage of 9.4% followed by no good café or restaurants (7.5%). The rest of the difficulties were minor in their classification (Fig. 18).

2.2.13 Recommending Others to Visit Aqaba

More than half of the sample indicated that they will recommend others to visit Aqaba, while 21.6% indicated that they perhaps recommend others to visit Aqaba. The rest of the sample were not sure, or do not recommend or never recommend visiting Aqaba (Fig. 19).

2.2.14 The Preferred Events in Aqaba According to Tourist's Perspectives

About 18.3% of tourists indicated that they prefer to have traditional food festivals, while a guided tour of walking trails on a specific story such as history, craftsman and sweats was the second activity preferred by tourists with a percentage of 17.3%. Traditional music and dance festival was the third preferred activity by tourists (Fig. 20).

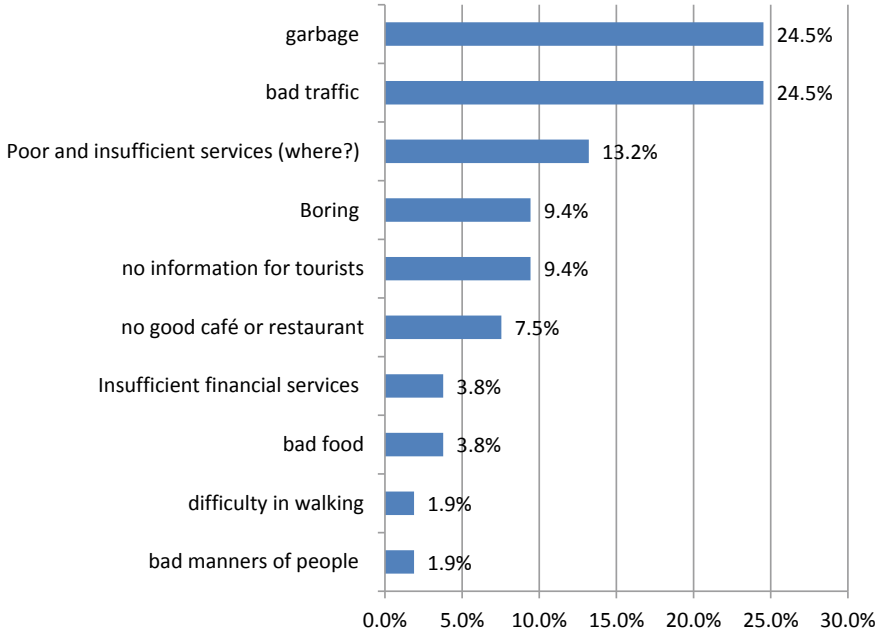


Fig. 18 The difficulties faced tourists during visiting Aqaba

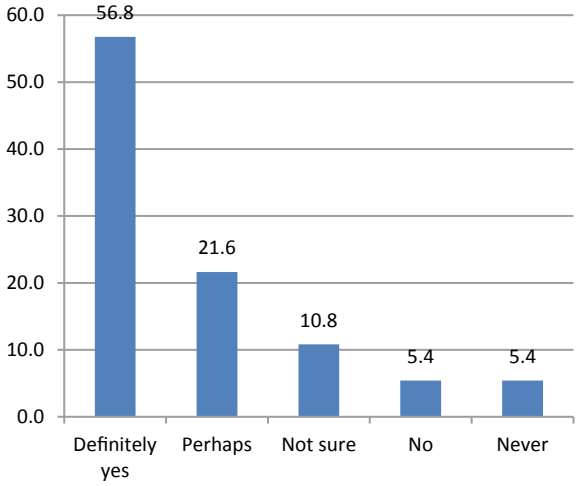


Fig. 19 Recommending others to visit Aqaba

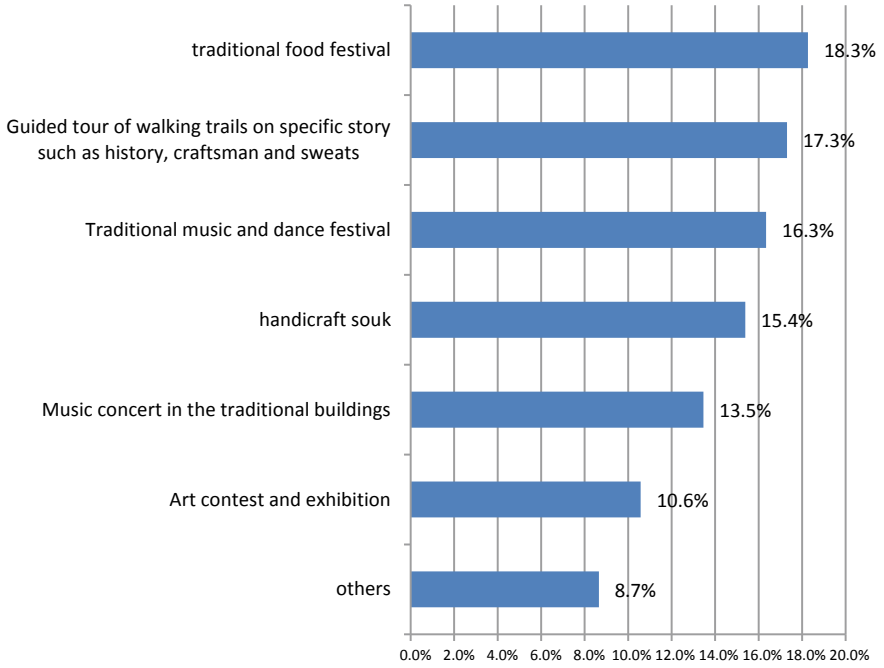


Fig. 20 The preferred activities according to tourists

3 SWOT Analysis of Aqaba Tourism Market

According to Kerzner, tourism is a service sector that earns a substantial foreign exchange to developing countries. In Jordan, Aqaba is one of the important destinations for international tourists with its unique natural beauty with underwater life, Arabic culture, and heritage, mountains of Wadi Rum, and beaches. Tourism has become a popular global leisure activity and it a highly competitive industry, it is necessary for the tourism industry to formulate market analysis which should include the overall business objectives and an assessment of the market environment, especially for tourism destinations that highlight the attractions best features, provides an economic impact to the destination.

This study made the cornerstone of the tourism market in Aqaba in early 2016 as part of its intuitional support for ASEZA, a European Union Development Programs, (Sustainability and Tourism in the Mediterranean Project) providing support to help market Aqaba as a branded tourism destination. Based upon the result of this study, tourists' expectations before visiting Aqaba depend on the information they receive from their agents, friends, or any other source of information they use. When the current situation does not meet the expectations, especially for foreign tourists, the long impact on promoting Aqaba as a tourist place will drop. The image of Aqaba as a tourist place will depend on different characteristics including transportation, what

can be visited while getting there, and what is there. These three components were covered by the questionnaire, which will be used to analyze the market their using SWOT analysis.

Table 2 shows the SWOT analysis of tourism's current status in Aqaba. The matrix shows that there are many strong components of tourism in Aqaba. The most important of them those different attractive elements are there in Aqaba. The weather in winter times is considered one of the attractive elements for tourism, especially for local tourism. Another important element is the existing different historic places in Aqaba which represent different old ages as well as summarize part of Jordan's history. Moreover, the sea in Aqaba is a major tourism component that facilitates swimming activities as well as other related activities. Getting to Aqaba as the southern city of Jordan tourist needs to pass three governorates Karak, Tafeela, and Maan. The three governorates are considered rich in tourism places that are considered highly supportive in planning trips to Aqaba. The strength elements showed that the nature of Aqaba is considered encouraging and strong base for tourism in the city.

This result was online with the updating Tourism Market Strategy in (2013–2015). The strategy suggested that the traditional trend of international tourists coming to Aqaba for a relaxation-beach experience as part of a 'classic' Jordan tour is continuing. However, there is an increase in the number of visitors, particularly from Scandinavian countries, and to some extent, Eastern Europe, in search of good weather is using Aqaba as a base and extending the length of stay significantly for their segment.

Table 2 SWOT Analysis Matrix for Aqaba Market According to the Result of this Study

Strength	Weak
Wide variety of tourism components – Sea – Different weather – Historic places – Closeness to other tourist places – Wadi Rum, Petra – Summer sun (charter and domestic) – Winter sun (mainly charter and domestic) – Diving	– Weak transportation methods – Immature infrastructure (City – cleanness, traffic jam, local tourism promotion – Program activities – Children activities – Online ticketing – High Prices – Lack of well-arranged parks and attracted natural places
Opportunity	**Threats**
– Promoting historic places in Aqaba – Improving cultural activities including folklore, food, and other parties that reflect Aqaba – Improving nightlife activities – Improving infrastructure – Using empty places to construct new tourist activities to alleviate crowding – Promoting Aqaba as an integrating component with other tourism places in Jordan	– High prices – Excluding local area citizens from tourist activities – Lack of tourist entertainments places (such as cafés, restaurants, and night entertainment places) – Competitors from the near tourism destinations

However, overall Aqaba's length of stay is really low at 2.17 nights for three-four- and five-star hotels.

According to the Market Tourism Strategy (MTS), the main products being sold are as follows:

- Summer sun (charter and domestic)
- Winter sun (mainly charter and domestic)
- Diving
- Cruise tourism
- Heritage (base for Petra)
- Desert and activities (base for Wadi Rum)
- Other water sports and beaches (mainly domestic tourism).

On the other hand, the analysis of the situation in Aqaba in this study shows different weak elements in tourism infrastructure in the city which as pointed out by tourists. The major one was the lack of transportation management in the city, which makes it a weak point for tourists to rely on when touring in the city. The traffic jams in the city were indicated as other weak points. The crowding has resulted in the concentration of facilities in the limited area causing traffic jams and difficulties in pedestrian movement. The clean of the city is considered another weak point that should be handled. Even though, the efforts made to improve the cleanliness of the city, the culture of cleanness should be distributed among the tourists, particularly local ones to help improve the cleanliness of the city.

Another weak element was raised by tourists is the poor activities included in the tourist programs in Aqaba. These poor programs create boring for tourists in particular during night times. The tourists expected to see a city with a wide range of tourist activities distributed in different places. Moreover, the city lacks any activities for children's entertainment, which creates a shortage of services available for tourism in the city. Online ticketing was a difficulty faced by tourists when reserving in activities, indicating the presence physically to solve this issue. This creates an overburden for tourists. Some tourists complained of the high prices in Aqaba, which seems impediment for tourists to utilize a wide variety of activities. Some other tourists have shown that Aqaba lacks public parks and natural places that can be used for entertainment.

Nevertheless, some of the weaknesses points were obtained from this study were also online with the (MTS), these can be summarized as follow:

- Aqaba's hotels are not considered price-competitive. There is an understanding of the increase in the cost of utilities and overheads and that the benefits of Special Economic Zone status are not being passed on.
- There is a severe lack of hotels outside of the five-star category.
- Although the issue has been alleviated somewhat by the launch of the Berenice Beach Club which is considered a quality product, limited public access to the beach is a concern to operators.

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- The availability of quality restaurants, other than hotel restaurants is severely limited and does not support extending the length of stay. In addition, there are no quality authentic restaurants or food experiences.
- The current range of activities other than water-based activities and excursions to Petra and Wadi Rum are extremely limited. There is an understanding that some desired experiences are being developed by the mega projects however, more daytime and nighttime activities are required in the city. The development of such activities is critical.
- There is a great lack of pedestrian-friendly areas and footpaths for tourists to explore. Requests were made for closing some streets to cars either for a 24 h period or at least from midafternoon until the evening.
- The increase in domestic tourism has increased the challenge that lack of parking presents. The result is considered to be having a negative effect that is both dangerous and time-consuming and greatly impacts the quality of the tourism experience.
- There is a great lack of pedestrian-friendly areas and footpaths for tourists to explore. Requests were made for closing some streets to cars either for a 24 h period or at least from midafternoon until the evening.

As a result of this study, there are a lot of opportunities in Aqaba that can be utilized to improve tourism and create a more attractive city. One major activity is promoting historic places in Aqaba. This activity to be included in tourists' programs will introduce added value for tourists. The visitor of Aqaba expected to see some folklore activities that reflect the culture there, but these activities have not existed anywhere in Aqaba city. The governorate of Aqaba should find special streets for talented people to practice these activities in. Moreover, the introduction of local food will be considered an encouraging tool for tourists to share and live while visiting Aqaba. Most tourists complained of boring because it has resulted in a lack of street activities that fill the tourist times.

Citizens in Aqaba should be trained to participate in tourism activities. Local vocational training programs should be including Aqaba citizens to practice activities that are considered a source of income and improve entertainment in the city. Folklore programs should be stated in continuous programs all over the year. On the other hand, tourists indicated that Aqaba lacks good restaurants to use or café to enjoy in the city. This indicates that existing places are all popular initiating the need to construct new places with suitable entertainment for tourists.

The core of the city suffers from crowding due to the concentration of most activities in this part of the city, while the other parts lack any attractive activities or trade movement that helps in attracting visitors out of crowding. Also, the traffic jams occurred in Aqaba as the concentration of trade movement is concentrated in a little number of streets which creates this crowding. The opportunity in this aspect is to expand activities to other parts of Aqaba which improve the entertainment of tourists in one aspect and solve the traffic jams in the middle of the city. The opportunity to succeed in arranging trips to Aqaba is to include it as part of the integrated program with other tourism places in Jordan such as Petra and Wide Ram.

According to the MTS many opportunities should the Jordanian tourism market in general and the tourism market in Aqaba in particular benefit from them, for example, Asia showed strong growth of 7% in outbound travel as incomes rise and consumers can travel more. China and Japan in particular performed strongly with double-digit growth rates in outbound travel. Prospects for Asian tourism in 2013 are even stronger.

The Market Tourism Strategy concluded that many opportunities are available for the tourism market in Aqaba; such opportunities can be as follows:

- Responsible Tourism: The trend in demand for responsible tourism is continuing to rise and greater account is being taken off the congestion tourism generates and of the negative effects on resources and host communities that can come with it. Although some developers (such as Saraya) are giving extensive emphasis to Corporate Social Responsibility (CSR), Aqaba has a long way to go in terms of responsibility. Green practices, such as reducing waste and emissions, using alternate energy sources, and producing natural products, have become something of a "me too "cause in recent years. Yet companies and destinations with a history in green innovation have reaped the most benefits and are making real cost savings, and will continue to do so through the economic recession and beyond. ASEZA has initiated a Green Key program for hotels, and this needs to be marketed.
- Community-Based Tourism: There is a growing demand for transparency in social and economic benefit to communities and tourism contribution to preservation and promotion of cultural heritage. There is growing support by the international tourism trade, including major international operators to recognize destinations and businesses who are actively addressing these sustainability themes. There is an increasing trend among tour operators in transparency in their choice of suppliers based on these themes. Based on its brand position and differentiation from other Red Sea resorts as a living city, the demand for community-based tourism is a good opportunity for Aqaba through the development of community-based tourism experiences and community engagement. To support the development of community-based tourism, the implementation of ongoing tourism awareness and training plan is required as a priority.
- Diving Tourism: Diving tourism is the main reason for travel and as an ancillary product continues to grow and divers are continuously looking for new and interesting destinations to dive. According to Professional Association of Diving Instructors (PADI) figures, in 2012, PADI cumulative diving certification figures alone reached more than 21 million worldwide – though some divers may hold more than one certificate. Two-thirds of PADI certified divers are men and though divers cover every age bracket, the median age of divers is 30. While this is an easy segment to target, consideration must be maintained in that the diving product worldwide needs particular environmental care, the highly informed diving community is extremely sensitive to coral deterioration and litter problems, and diving destinations that do not manage and regulate these issues face a backlash.

- Culinary Tourism: The tourism market internationally is increasingly being influenced and motivated by food and culinary experiences. Visitors are increasingly demanding a wide range of quality dining experiences and the availability of these experiences is influencing both destination choice and the perception of the quality of the overall holiday experience and satisfaction criteria. In addition, there is a growing demand for a variety of quality, authentic local food, and culinary specialties. Tourists want to try distinctive foods that reflect the tradition, heritage, and culture of a place, and which preserve traditional forms of agriculture and cultural heritage. As food and dining are a major component of Jordan's history and culture, from authentic dishes to seasonal dishes to celebratory dishes, Aqaba can benefit from this growing market if the range of experiences is increased and standards and quality are raised.
- Family Tourism: The family tourism market continues to grow internationally from both traditional tourism markets and new tourism markets. Aqaba has had growing success in attracting family business, particularly after the establishment of Tala Bay. The potential for family tourism from traditional markets such as Russia and new markets such as China and India are great and are increasing.
- Shopping: Shopping while on holiday has always been an income generator. While there is a significant increase in shopping destinations, shopping as an ancillary product remains one of the highest contributors for both traditional and developing tourism markets.
- Value for Money: While there will always be ultra-deluxe products catering for small but growing numbers of wealthy clients and special occasions, value-for-money has become critical in most current travel decisions, a growing trend as a result of the economic crisis, facilitated by numerous travel blogs, travel forums, and booking engines. Consumers now have much better cost-comparison tools. This is a key challenge for Aqaba; while some hotels are addressing this issue, many hotels need to change to room yield pricing rather than using fixed pricing.
- Safety and Security: Safety and security are important to tourism's continued growth. Tourism does however show increased resilience: travelers are better informed; they have acquired a more balanced perspective; they now include security concerns as just another consideration when selecting destinations. Aqaba and Jordan can benefit from this trend.

4 Conclusions

As mentioned earlier, this study was conducted to spot the light on the current conditions of the tourism market in Aqaba City. The survey was conducted to understand the current conditions of tourism products and tourist perceptions in Aqaba City by using a quantitative technique, mainly a questionnaire. The sample covered composed of a wide variety of nationalities. The average age for tourists was younger than expected which could indicate that Aqaba was getting more famous and recognized by young people in general.

It was concluded through the analysis that Aqaba is highly visited by both genders of various ages, indicating that tourists were diversified because they mainly felt comfortable being in Aqaba, and it was recommended by them to be visited by others. It could be also concluded that Aqaba was a family tourism destination as most tourists came to Aqaba along with their husband/wife, and the majority of them spend two to three days in Aqaba which indicated that tourists feel safe and comfortable coming to Aqaba.

Tour buses were the dominant used as a method of transportation, and the rented cars were the second method of transportation used to get to Aqaba followed by the usage of both private or rental cars and the same time using taxi and tour buses through their visit to Aqaba. However, it was noticed that the vast majority of tourists complained about the public transportation sector which did not meet their needs.

The results also showed that breaking out of the routine and relaxation was the cause of selecting Aqaba. The second factor that affect the selection of Aqaba listed was the local product (Food and beverages). Meeting new people was ranked as a third cause of selecting Aqaba and curiosity about places/events unknown and unseen places was the fourth cause.

The highest practiced activity in Aqaba by tourists was eating local food and having drinks with percentage followed by diving. Shopping was the third activity practiced by tourists, followed by buying souvenirs. Visiting parks and nature attraction places in Aqaba was also having the attention of tourists. Boat tours and water sports were practiced. The communication with local people, visiting historic sites, living nightlife, other activities, and visiting family relatives and friends' houses were also activated by tourists. The expenses of tourists on different activities varied according to activity and the trip arrangements of tourists. For transportation, the highest percentage of tourists expended $1–50, followed by the $151–200 category. The results indicated that the expenses on transportation depend on the plans of the trip introduced for tourists. Concerning food and drinks, the majority of tourist expenses ranged from $51–100 followed by $1–50 with percentages of 38.5 and 34.6% respectively. This indicates that the majority of tourist food coverage is planned with the trip itself. The expense for a guide was ranging from $1–50 per tourist with a percentage of 60.0%. Expenses on souvenirs varied among tourists. The highest expenses ranged from $101–150 with a percentage of 25.0%, while the rest were distributed on different categories almost equally. Most of the sample paid entrance fees ranging from $101–150.

The outcomes revealed that tourists were generally satisfied during their visit to Aqaba, and more than half of the sample indicated that they will recommend others to visit Aqaba. The visit for the majority of tourists was arranged by a travel agent. This indicated that the majority of tourists are committed to the travel agent's plans to visit Aqaba. The first four places included in the package were Petra, the Dead Sea, Wadi Rum, and Mount Nebo. The reset of places distributed on Madaba, Amman, and Jerash. The garbage and bad traffic were the first two difficulties faced tourists during their visit. Poor and insufficient services were in the third rank. Boring and no information for tourists were two difficulties faced by tourists followed by no good café or restaurants.

4.1 Practical Implications and Recommendations

Most of the tourists who visited Aqaba complained about the transportation and traffic. Therefore, there is a need for local institutions to overcome this problem by facilitating access to important tourist attractions areas. Moreover, these institutions should give more attention to the cleanliness issue in Aqaba. Tourists indicated that Aqaba lacks good restaurants to use or café to enjoy in the city. This indicates that existing places are all popular initiating the need to construct new places with suitable entertainment for tourists. ASEZA should encourage the private sector to establish more cafés, restaurants, and so on in Aqaba. The relative intuitions should control prices, as tourists complained about the manipulation of prices, especially with tourists using their ignorance of prices. Another weak element was raised by tourists is the poor activities included in the tourist programs in Aqaba. These poor programs create boring for tourists in particular during night times. The tourists expected to see the city with a wide range of tourist activities distributed in different places. Authorities and policymakers in Aqaba should create a suitable and enjoyable activates program for tourists. This program might include activities such as Beach and Marine Tourism—Red Sea Access, Cultural Tourism—Proximity to Petra, Desert and Tradition—Proximity to Wadi Rum, Special Interest Tourism—(cruising, diving, family, etc.), More day time and night time and Shopping and walking street.

As a result, the city lacks any activities for children's entertainment, which creates a shortage of services available for tourism in the city. Online ticketing was a difficulty faced by tourists when reserving in activities, indicating the presence physically to solve this issue. This creates an overburden for tourists. Some tourists complained of the high prices in Aqaba, which seems impediment for tourists to utilize a wide variety of activities. Some other tourists have shown that Aqaba lacks public parks and natural places that can be used for entertainment. One major activity that should have the attention of policymakers in Aqaba is promoting historic sites. This activity to be included in tourists' programs will introduce added value for tourists. The visitor of Aqaba expected to see some folklore activities that reflect the culture there, but these activities do not exist anywhere in Aqaba city. Most tourists complained of boring because it has resulted in a lack of street activities that fill the tourist times. Therefore, the governorate of Aqaba should find special streets for talented people to practice these activities in. The introduction of local food will be considered an encouraging tool for tourists to share and live while visiting Aqaba. Citizens in Aqaba should be trained to participate in tourism activities. Local vocational training programs should be including Aqaba citizens to practice activities that are considered a source of income and improve entertainment in the city. Folklore programs should be stated in continuous programs all over the year. The core of the city suffers from crowding due to the concentration of most activities in this part of the city, while the other parts lack any attractive activities or trade movement that helps in attracting visitors out of crowding. Also, the traffic jams occurred in Aqaba as the concentration of trade movement is concentrated in a little number of streets which creates this crowding.

The opportunity in this aspect is to expand activities to another part of Aqaba which improves the entertainment of tourists in one aspect and solve the traffic jams in the middle of the city. The opportunity to succeed in arranging trips to Aqaba is to include it as part of the integrated program with other tourism places in Jordan in the northern, middle, and southern parts. An updated marketing strategy is required to cope with the challenges of filling Aqaba's increasing number of rooms and the expansion of its holiday home portfolio, to increase current hotel occupancy, extend the length of stay, and support the increase of value and benefits of tourism to the wider community.

In Aqaba, while some achievements have been realized, there are significant weaknesses in human resources, visitor attractions and activities, beach quality, family activities, night entertainment, general service quality both indirect tourism services and supporting tourism services, marketing, and competitiveness, which need to be addressed. The launch of Turkish Airlines into Aqaba provides great opportunities to promote the destination to their wide network from Europe and beyond, however, a keen focus on increasing access to underpin the accommodation expansion now in hand is imperative. While several achievements have been made recently, one significant aspect of the 2002 strategy that has yet to be realized is the development of Aqaba as a meeting, incentives, conferences, and exhibitions (MICE) destination. This has been hampered to date by a limited product (the National Convention Centre was built near the Dead Sea), limited room supply. A great deal needs to be done to transform a destination with 5-star hotels into a fully functioning 5-star destination that attracts and meets all the requirements for this level of customer. Tourism in Aqaba should be marketing along with Petra and Wadi Ram as standalone destinations. Finally, tourism in Aqaba needs a special Beach Management Board, which should be responsible for all tourism activities on the beach of Aqaba.

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Classification Thyroid Disease Using Multinomial Logistic Regressions (LR)

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Abstract Classifying using Multinomial Logistic Regression is one of the techniques used in the statistical model. Binomial logistic regression is a form of regression that is used when the dependent is a dichotomy and the independents are continuous variables, categorical variables, or both. Multinomial Logistic Regression Model is used to handle the case of dependent variables with more classes and suitable for non-linear data by using Maximum Likelihood Estimation and Wald Statistics. This experiment aims to predict the Thyroid disease Dataset by using the Multinomial Logistic Regression model. In this experiment, SPSS software is used to run the Multinomial Logistic Regression by Thyroid disease data supplied by Randolf Werner, which was adopted from the UCI Repository of *Machine Learning Database.*

Keyword Multinomial logistic regression and application of logistic regression

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_34

1 Introduction

Binomial (or binary) logistic regression is a form of regression that is used when the dependent is a dichotomy and the dependents are continuous variables, categorical variables, or both. Multinomial Logistic Regression exists to handle the case of dependents with more classes. However, Logistic regression applies maximum likelihood estimation after transforming the dependent into a logit variable (the natural log of the odds of the dependent occurring or not). In this case, logistic regression estimates the probability of a certain event occurring. Moreover, logistic regression calculates changes in the log odds of the dependent, not changes in the dependent itself as OLS regression does. Logistic regression can be used to predict a dependent variable based on the independent variable. Logistic regression is also used to see the percentage of variance the independent variable is capable of explaining the dependent variable.

Moreover, Logistic regression does not make any assumptions of normality, linearity, and homogeneity of variance for the independent variables. Because it does not impose these requirements, it is preferred to discriminant analysis when the data does not satisfy these assumptions. Logistic regression is used to analyze relationships between a non-metric dependent variable and metric or dichotomous independent variables. SPSS now supports Multinomial Logistic Regression that can be used with more than two groups.

Logistic regression combines the independent variables to estimate the probability that a particular event will occur, i.e. a subject will be a member of one of the groups defined by the dichotomous dependent variable. In SPSS, the model is always constructed to predict the group with higher numeric code. If responses are coded 1 for Yes and 2 for No, SPSS will predict membership in the No category. If responses are coded 1 for No and 2 for Yes, SPSS will predict membership in the Yes category. We will refer to the predicted event for a particular analysis as the modelled event. Figure 1 below the general model of logistic regression. There are three components for logistic regression. An input layer, transfer function and output layer.

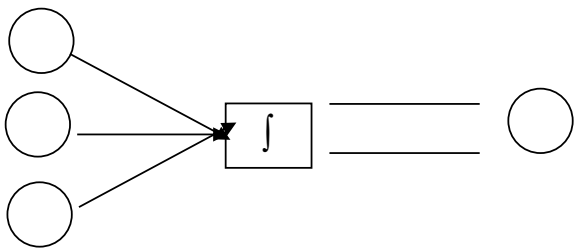

Fig. 1 The components for logistic regression

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2 Literature Review

The review of literature established an ideal reference source of material and research writing concerning Logistic Regression (LR) it has been commonly used in various fields in the medical, Information Retrieval, Production and so on. This section showed how many ways Logistic Regression (LR) can give the best result in many fields?

2.1 Application of Logistic Regression in Medical

Logistic regression application has been commonly used to provide solutions to the medical field. According to Ng and Lai (2004), the Application of Anthropometric Indices in Childhood Obesity has been used the Logistic regression method to determine which anthropometric index can best predict childhood obesity and to investigate the interrelationship between these anthropometric indices and metabolic abnormalities. Data were obtained on the children's anthropometry, blood pressure, and serum lipid profiles. Body mass index (cutoff points by international age and sex-specific body mass index [BMI]) and weight-length index (WLI) were measured. The result of this study showed that there were 951 girls (47.43%) and 1,054 boys (52.57%).

The mean age was 7.3 _ 0.4 years. The prevalence of obesity was 4.21% in girls and 7.87% in boys using BMI definition, 12.83% in girls and 14.14% in boys using WLI definition. The prevalence of obesity revealed an increasing trend with age in both sexes, whether by BMI or WLI definition. Moreover, the prevalence of childhood obesity was evidently underestimated by using the BMI definition or by using the WLI definition. Childhood obesity exhibits a significant correlation with some metabolic abnormalities both indices, BMI and WLI, should be used together to define childhood obesity in clinical practice until a more appropriate and excellent index can be established. Another application, According to Steyerberg et al. (2002) state that the Application of Shrinkage Techniques in Logistic Regression Analysis has been used to develop a predictive model for a dichotomous medical outcome, such as short-term mortality. When the data set is small compared to the number of covariables studied, shrinkage techniques may improve predictions. This study has been compared the performance of three variants of shrinkage techniques a linear shrinkage factor, which shrinks all coefficients with the same factor; penalized maximum likelihood where a penalty factor is added to the likelihood function such that coefficients are shrunk individually according to the variance of each covariable and the Lasso, which shrinks some coefficients to zero by setting a constraint on the sum of the absolute values of the coefficients of standardized covariables.

Logistic regression models were constructed to predict 30-day mortality after acute myocardial infarction. Small data sets were created from a large randomized controlled trial, half of which provided independent validation data. The result of this study showed that all three shrinkage techniques improved the calibration of predictions compared to the standard maximum likelihood estimates. This study showed that shrinkage is a valuable tool to overcome some of the problems of overfitting in medical data.

2.2 Application of Logistic Regression Information Retrieval IR

Larson (2002) has applied the application of Logistic Regression to the problem of distributed Information Retrieval (IR). However, using a Logistic Regression algorithm for estimation of collection relevance. The algorithm is compared to other methods for distributed search using test collections developed for distributed search evaluation. As increasing numbers of sites around the world make their databases available through protocols such as OAI or Z39.50 the problem arises of determining, for any given query, which of these databases is likely to contain information of interest to a worldwide population of potential users. This is the central problem of distributed IR and there's much research have been active in this area such as (Becker et al., 2010; Callan, 2002) on GlOSS application of inference networks to distributed IR (CORI).

Along with several collaborators (Powell & French, 2003) enabled comparative evaluation of distributed IR by defining test collections derived from TREC data, where the TREC databases are divided into sub-collections representing virtual distributed collections. In addition, they defined some measures for evaluation of the performance of distributed IR used in this study to compare previously published results on collection selection with a probabilistic model based on logistic regression.

2.3 Application of Logistic Regression in E-rater

The linear logistic regression model is considered one of the most important and widely applicable techniques in analyzing. According to Qian (2003), logistic regression has been used widely currently in building e-rater models instead of linear regression. In this study, comparisons between logistic regressions with linear regression were made and tried to show the appropriateness of the use of logistic regression modelling in the analysis of *e-rater* data. There are several strategies in logistic regression modelling, which are:

(a) Forming suitable training data set and cross-validation data.
(b) Including high order interactions of features in model construction.
(c) Using three different types of estimators in prediction.
(d) Adjusting predicted scores.

As a result of this study, these factors played key roles in incorporating logistic regression models to *e-rater* modelling and help to outperform the linear regression. Using exact agreement as to the criterion of logistic regression in most situations, exceeded the regular linear regression model.

2.4 Objectives

Generally, the objective of this project is to classify thyroid data using the Neural Networks approach.

3 Methodology

3.1 Multinomial Logistic Regression Tool

The multinomial Logistic Regression tool used is SPSS Version 11.5 for processing the dataset. The dataset is taken from the raw data of the Thyroid Disease dataset in the UCI Repository of Machine Learning Databases to determine whether a patient referred to the clinic is hypothyroid. The data then was processed using the SPPS Version 11.5 according to the following process as shown in Fig. 2. Firstly, all the data are converted from Microsoft Excel format.

Next, the data are imported to the data source according to columns in the SPSS format by selecting Analyze menu, Regression and then Multinomial. All the variables are named according to its attribute in the variable view. A Multinomial Logistic Regression setup was used to configure the data according to the experiment required as in Fig. 3.

For the next step (refer to Fig. 4) insert the target in the dependent variable and insert the rest of the attributes in the covariates. To obtain the classification table as part of the regression analysis, select ***Statistics*** and check the Classification dialogue box as shown in Fig. 5.

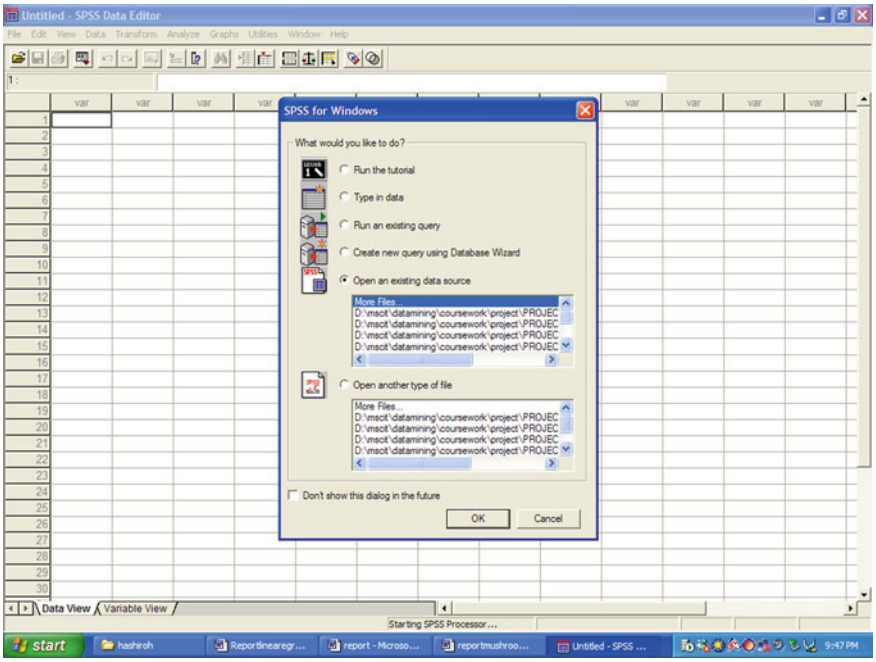

Fig. 2 Multinomial logistic regression process

4 Experimental Results

4.1 Multinomial Logistic Regressions

From Tables 1 and 2, both of the tables show the target has three classes to predict for the thyroid diseases dataset. For the first class, the percentage of correctly classified is 100%, for the second class the percentage correct is 100% and for the third class, the percentage correct is 100%. As a result, the total percentage of correct classification of the classes are 100%. There is no missing value from the dataset.

4.2 To Test the Significance of the Chi-Square

Model chi-square provides the usual significance test for a logistic model to see whether the hypothesis created is accepted or rejected. Model chi-square tests the null hypothesis that the independent variables are not linearly related to the log odds of the dependent variables. That is, model chi-square tests the null hypothesis that all population logistic regression coefficients except the constant are zero. It is thus an overall model test that does not assure that every independent is significant. From

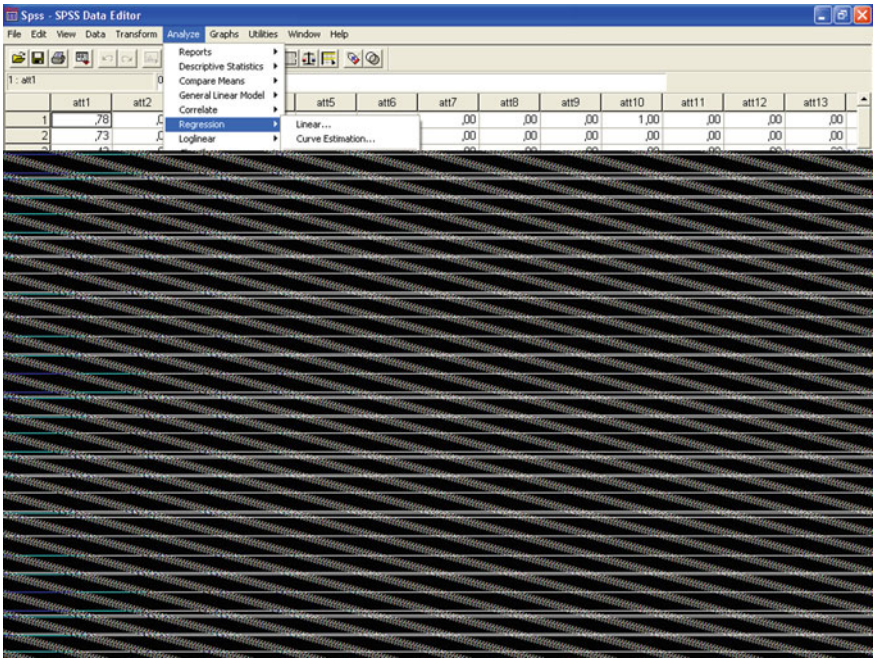

Fig. 3 Setting up multinomial logistic regression

Table 3, the probability of the model chi-square (662.322) is significant at 0.000 levels which is less than 0.05 (95%). Therefore, the hypothesis is rejected and the independent variables are linearly related to the log odds of the dependent variables (for each independent variable).

4.3 Pseudo-R-Square

Pseudo-R-Square is an Aldrich and Nelson's coefficient which serves as an analogue to the square contingency coefficient, with an interpretation like R square. Its maximum is less than 1. It may be used in either dichotomy or multinomial logistic regression. The Cox and Snell, Nagelkerke or McFadden in Table 4 attempt to provide a logistic analogy to R-square in the Multiple Linear Regression. The performance of this model using thyroid disease data set is 100%.

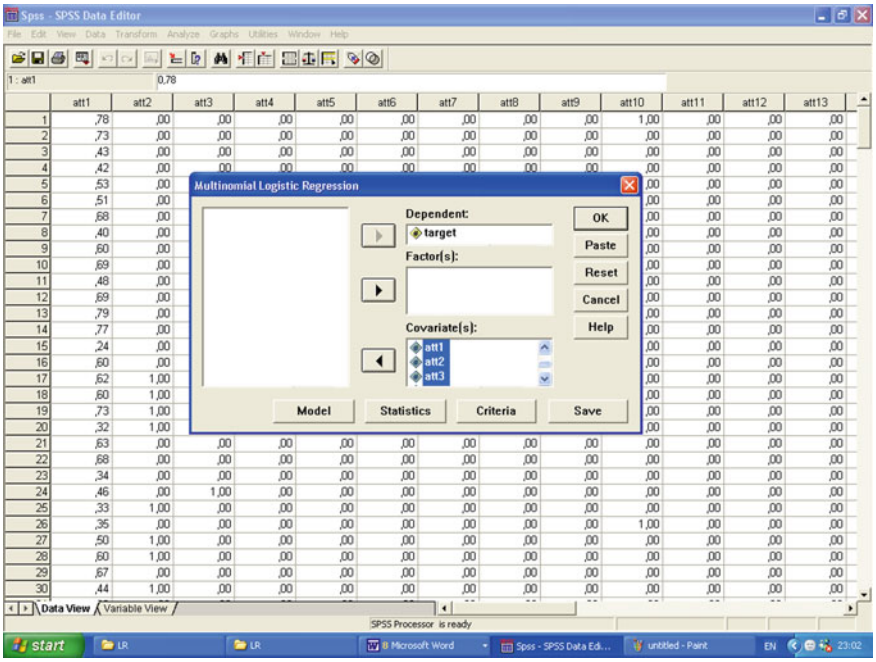

Fig. 4 Multinomial logistic regression process with dependent and independent variables

4.4 Likelihood Ratio Tests

The further analysis is by examining each of the independent variables using the –2 likelihood ratio tests or Likelihood Ratio Tests. The "–2 Log Likelihood" above is "model chi-square" which is used to test the significance of the logistic model the chi-square statistic is the difference in –2 log-likelihoods between the final model and a reduced model. Omitting and effect from the final model form the reduced model.

The reduced model is formed by omitting an effect from the final model. When probability (model chi-square) is less than or equal to 0.05, the null hypothesis that knowing independent in logistic regression is rejected. Thus, model chi-square needs to be significant at the 0.05 level or better. The null hypothesis is that all parameters of that effect are 0. Table 5 shows that the independent variable ATT16 is significant at below 0.05 levels. Therefore, the hypothesis is rejected. On the other hand, nineteen variables have a significance value of more than 0.05, which are ATT1, ATT2, ATT3, ATT4, ATT5, ATT6, ATT7, ATT8, ATT9A, TT10, ATT11, ATT12, ATT13, ATT14 ATT15, ATT17A, TT18, ATT19, ATT20 have the relationship between the dependent variable, TARGET. Therefore, further analysis needs to be considered.

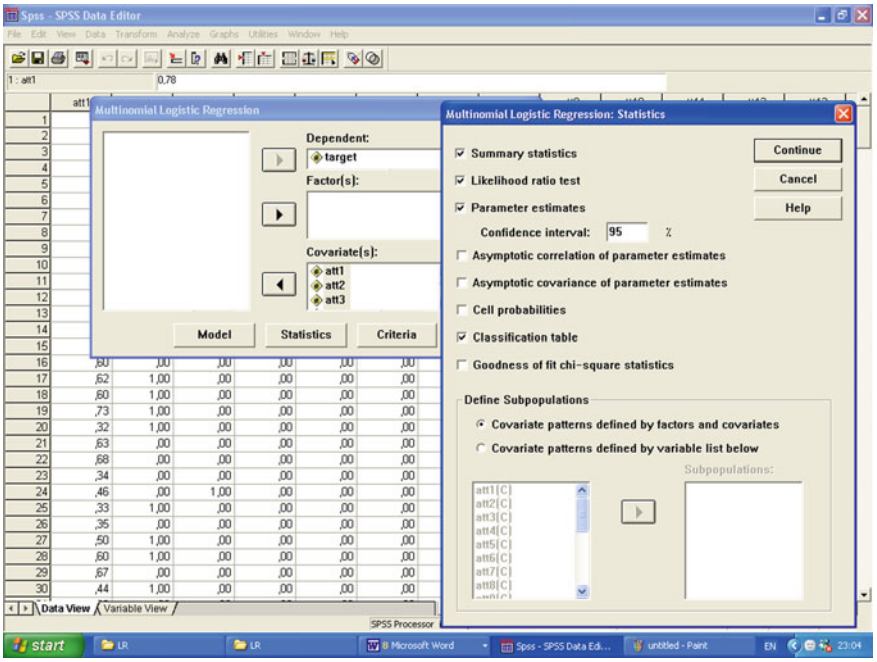

Fig. 5 Final process for producing the output view

Table 1 Case processing summary

		N
Target	1.00	92
	2.00	105
	3.00	105
Valid		302
Missing		0
Total		302

Table 2 Classification

Observed	Classification			
	1.00	2.00	3.00	Percent correct (%)
1.00	92	0	0	100
2.00	0	105	105	100
3.00	0	0	0	100
Overall percentage	30.5%	34.8%	34.8%	100

Table 3 Model fitting information

Model	−2 Log Likelihood	Chi-Square	df	Sig
Intercept only	662.425			
Final	0.104	662.322	40	0.00

Table 4 Pseudo R-Square

Cox and Snell	0.888
Nagelkerke	1.000
McFadden	1.000

Table 5 Likelihood ratio tests

Effect	−2 log likelihood of reduced model	Chi-Square	df	Sig
Intercept	0.128[a]	0.024	2	0.988
ATT1	0.935[a]	0.831	2	0.660
ATT2	0.017[a]	−0.087	2	1.000
ATT3	0.105[a]	0.001	2	0.999
ATT4	0.038[a]	−0.065	2	1.000
ATT5	0.104[a]	0.000	2	1.000
ATT6	0.038[a]	−0.065	2	1.000
ATT7	0.038[a]	−0.065	2	1.000
ATT8	0.039[a]	−0.665	2	1.000
ATT9	0.291[a]	0.187	2	0.911
ATT10	0.106[a]	0.002	2	0.999
ATT11	0.104[a]	0.000	2	1.000
ATT12	0.041[a]	−0.063	2	1.000
ATT13	0.038[a]	−0.066	2	1.000
ATT14	0.754[a]	0.650	2	0.722
ATT15	0.039[a]	−0.065	2	1.000
ATT16	228.462[a]	228.358	2	0.000
ATT17	2.085[a]	1.981	2	0.371
ATT18	0.102[a]	−0.002	2	1.000
ATT19	0.101[a]	−0.003	2	1.000
ATT20	0.015[a]	−0.089	2	1.000

The chi-square statistic is the difference in −2 log-likelihoods between the final model and a reduced model. The reduced model is formed by omitting an effect from the final model. The null hypothesis is that all parameters of that effect are 0

[a]Unexpected singularities in the Hessian matrix are encountered. There may be a quasi-complete separation in the data. Some parameter estimates will tend to infinity

4.5 Wald Statistic

The Wald statistic above and the corresponding significance level test the significance of the covariate and factors (dummy) independents in the model. The Wald statistic is commonly used to test the significance of individual logistic regression coefficients for each independent variable. It is the ratio of the unstandardized logit coefficient to its standard error. The null hypothesis is a particular effect coefficient is zero. From Table 6, the probability of the Wald statistic for all the independent variables is more than 0.05, therefore the variables are not significant which the null hypothesis cannot be rejected since the coefficient for all independent variables is zero. As result, all variables are not significant to predict Thyroid Disease Dataset.

5 Conclusion

The conclusion from this experiment showed that not all the independent variables have the coefficient effect with the dependent variable. However, from the performance between Multilayer Perceptron, Multiple Linear Regression and Logistic Regression, the Thyroid Disease Dataset is best to analyze using Logistic Regression, with 100% compared to Multi-Layer Perceptron 78.208% and Multi Linear Regression 65.5%. Table 7 concludes the result.

Table 6 Parameter estimates (Wald Statistics)

	Target	B	Std. Error	Wald	df	Sig	Exp(B)	95% confidence interval for Exp(B)	
								Lower bound	Upper bound
1.00	Intercept	111.101	2152.785	0.003	1	0.959			
	ATT1	73.048	209.239	0.122	1	0.727	5.3E + 31	4.168–147	6.7411 + 209
	ATT2	−6.508	68.344	0.009	1	0.924	1.491E−03	9.980E−62	2.2282E + 55
	ATT3	−24.762	304.057	0.007	1	0.935	1.761E−11	2.702–270	1.1480 + 248
	ATT4	30.202	32,679.454	0.000	1	0.999	1.3E + 13	0.000	[a]
	ATT5	69.855	681.283	0.011	1	0.918	2.2E + 30	0.000	[a]
	ATT6	397.605	3280.806	0.015	1	0.904	4.76 + 172	0.000	[a]
	ATT7	129.102	2149.969	0.004	1	0.952	1.17E + 56	0.000	[a]
	ATT8	5.442	0.000		1		230.907	230.907	230.907
	ATT9	−15.632	311.250	0.003	1	0.960	1.626E−07	1.883−272	1.4030 + 258
	ATT10	18.452	997.501	0.000	1	0.985	1.0E + 08	0.000	
	ATT11	−143.596	9149.724	0.000	1	0.987	4.336E−63	0.000	[a]
	ATT12	131.783	3515.224	0.001	1	0.970	1.71E + 57	0.000	[a]
	ATT13	9.353E−02	927.382	0.000	1	1.000	1.098	0.000	[a]
	ATT14	−107.399	1626.991	0.004	1	0.947	2.276E−47	0.000	[a]
	ATT15	27.356	585.486	0.002	1	0.963	7.6E + 11	0.000	
	ATT16	10,987.618	10,692.042	1.056	1	0.304		0.000	[a]
	ATT17	615.440	3179.081	0.037	1	0.846	1.91 + 267	0.000	[a]
	ATT18	−1283.398	39,510.774	0.001	1	0.974	0.000	0.000	[a]
	ATT19	496.005	24,682.969	0.000	1	0.984	2.58 + 215	0.000	

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Table 6 (continued)

	Target	B	Std. Error	Wald	df	Sig	Exp(B)	95% confidence interval for Exp(B)	
								Lower bound	Upper bound
	ATT20	−3068.229	34,542.601	0.008	1	929	0.000	0.000	[a]
2.00	Intercept	−108.300	523.991	0.043	1	0.836			
	ATT1	5.930	74.836	0.006	1	0.937	375.972	7.490E−62	1.8872E+66
	ATT2	−3.537	16.749	0.045	1	0.833	2.909E−02	1.610E−16	5.258E + 12
	ATT3	6.681	240.439	0.001	1	0.978	797.211	1.737−202	3.6587 + 207
	ATT4	18.814	32648.326	0.000	1	1.000	1.5E + 08	0.000	[a]
	ATT5	0.589	324.432	0.000	1	0.999	1.803	1.256−276	2.5872 + 276
	ATT6	22.557	3036.615	0.000	1	0.994	6.3E + 09	0.000	[a]
	ATT7	20.380	931.428	0.000	1	0.983	7.1E + 08	0.000	[a]
	ATT8	−8.143	749.070	0.000	1	0.991	2.908E−04	0.000	[a]
	ATT9	−13.090	309.786	0.002	1	0.966	2.066E−06	4.218−270	1.0123 + 253
	ATT10	7.671	974.787	0.000	1	0.994	2146.054	0.000	[a]
	ATT11	14.563	457.441	0.001	1	0.975	2111993	0.000	[a]
	ATT12	−29.420	3189.320	0.000	1	0.993	1.671 E−13	0.000	[a]
	ATT13	4.778	421.292	0.000	1	0.991	118.881	0.000	[a]
	ATT14	−71.627	2495.788	0.001	1	0.977	7.809E−32	0.000	[a]
	ATT15	16.880	220.326	0.006	1	0.939	2.1E + 07	6.160−181	7.4544 + 194
	ATT16	10854.727	1 0801.21 8	1.010	1	0.315	[a]	0.000	[a]
	ATT17	236.121	1874.495	0.016	1	0.900	3.51 + 102	0.000	[a]

(continued)

Table 6 (continued)

	Target	B	Std. Error	Wald	df	Sig	Exp(B)	95% confidence interval for Exp(B)	
								Lower bound	Upper bound
	ATT18	−401.588	5405.697	0.006	1	0.941	3.912−175	0.000	[a]
	ATT19	301.551	5062.226	0.004	1	0.952	9.16 + 130	0.000	[a]
	ATT20	526.839	5766.177	0.008	1	0.927	6.36 + 228	0.000	[a]

[a]Foating point occurred while computing this statistic, its value is therefore set to system missing

Table 7 Comparison between multilayer perceptron, multiple linear regression and logistic regression

Multi-layer perceptron (MLP)	Multiple linear regression (MLR)	Logistic regression
78.208%	65.5%	100%

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IT Governance and Control: Mitigation and Disaster Preparedness of Organizations in the UAE

Ismail Ali Al Blooshi, Abdulazez Salem Alamim, Raed A. Said, Nasser Taleb, Taher M. Ghazal, Munir Ahmad, Haitham M. Alzoubi, and Muhammad Alshurideh

Abstract The success of any business continuity today depends on its levels of preparedness to address any disasters that could emerge from the risks it faces in its operations. Most of the businesses in the UAE have adopted information technology and systems to aid them in their operations. Unfortunately, the adoption of such systems enhances the risks that businesses face, hence the need to ensure they adopt reliable disaster management strategies to address any potential challenges they could face. The aim of this research is to review and measure the levels of information system disaster preparedness in both the private and public sector organizations operating in the UAE. A study was conducted to measure the use of some of the popular disaster risk management models such as STRIDE, DREAD, and BCM. The study indicated that many of the firms in the UAE are not fully prepared to tackle disasters emanating from their information management systems but have

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_35

taken some steps and have invested part of their resources in improving the state of their preparedness. The findings in this paper can benefit researchers in the field of IT, private and public organizations in the region, government entities, and other stakeholders investing in the gulf country.

Keywords Business continuity management · Disaster preparedness · IT governance · Risk management

1 Introduction

The United Arab Emirates (UAE) is undisputedly one of the most attractive investment destinations in the world. Studies on its economy indicate that the country has grown at an unprecedented scale and rate over the past few years pre Covid-19. The emergence of the UAE as an economic hub in the MENA (Middle East and North Africa) and GCC (Gulf Cooperative Council) regions and its profile as a leading oil and gas producer has attracted significant interest for investment in the country (Al-Gasaymeh et al., 2020; Alshubiri et al., 2019; Assad & Alshurideh, 2020a, b; Shah et al., 2020, 2021;). According to Mosteanu (2019), the country has combined strategic investment in business and the development of technology to position itself as an appealing destination for both local and international entrepreneurs and investors. The business sector of the UAE remains one of the most advanced and diversified, considering the large number of investors that have initiated operations in the country (De Jong et al., 2019). Technologies intended for improved decision-making strategies, enhancing operational efficiency, and guaranteeing the security of the resources, including data and information, have been among the most popular. Given such a trend, the levels of investment in technology in the businesses operating in the country have been reviewed in several studies (Alzoubi & Aziz, 2021). Today, the UAE enjoys foreign investment borne out of the significant investments both public and private sector stakeholders have made in the adoption and utilization of technology in their operations (Mahmah & Kandil, 2019). The high levels of reliance on technology for operations mainly in trade and industry in the UAE has led to concerns regarding the threat of IT-related disasters, which could destroy not just organizational-level activities and operations but also the delivery of services to the public (Haddad et al., 2020).

Unfortunately, businesses across the country have faced various disaster that has highlighted some of the weaknesses in the technologies in place. Ali et al. (2022) explains further that the concept of disaster recovery has not been fully mastered and incorporated with the technologies, specifically the information systems in place in most of the country's businesses.

The trend of disasters involving information systems across the world has been worsening each day (Geer et al., 2020). Businesses have recorded significant losses arising from the emergence of disasters affecting their operations directly across the country. Geer et al. (2020) indicated that the trend is getting even worse each

considering the uncontrolled sprouting of technologies and their adoption even when the required approvals and certification is undertaken. The trend has affected the UAE directly considering that it is a leading hub for business and innovation, as shown in (Kashif et al., 2021). The country has invested heavily in encouraging innovators to come up with technologies that can help improve the trends of business performance in the country (Alzoubi & Ahmed, 2019). The rapid trend of technology development has made it impossible for UAE regulators to control the nature of technological ideas and innovations that end up being incorporated into the operations of various businesses (Al-Maroof et al., 2020; Alketbi et al., 2020; Alshurideh et al., 2021; Amarneh et al., 2021; Baadel et al., 2017; Leo et al., 2021; Turki et al., 2021). Unfortunately, unless the trend is controlled, the risk of disasters will continue to rise, thereby affecting the business continuity and ambitions of the UAE negatively.

The introduction of disaster and fault-preparedness systems in the field of business has emerged to be a positive aspect of global business operations. According to Li et al. (2019), recent innovations have enabled the creation of systems that can detect disasters before they happen, present warnings, recommend corrective measures to enable the prevention of major risks that could affect the business negatively. Li et al. (2019) further explain that in the event of a disaster, such systems can safeguard the resources of the business to enable the kickstarting of the recovery process once everything is under control from the effects of the disaster (Lee et al., 2022a, b). Disaster recovery solutions for information technology systems have not been developing at the same rate as the IT systems in place currently (Mendonca et al., 2019). The situation complicates the ability of business organizations to acquire information technology systems that fit the nature of their operations and to enable them to remain secure at all times considering that the environment of operation in the modern market is defined by unending uncertainty (Alzoubi et al., 2021). The findings of Mendonca et al. (2019) study make it necessary for scholars reviewing the UAE context of disaster recovery systems to consider reviewing the strategies in place in the businesses and the markets to enable an effective approach to guarantee the safety and resource security even after disasters (Alshurideh et al., 2022a, b; Radwan & Farouk, 2021).

The research undertaken herein focuses on the strategy on the development, adoption, and incorporation of disaster recovery systems in the UAE (Alzoubi et al., 2022). It has been indicated that the development of a disaster recovery system, their adoption and incorporation to business and organizational operations remains to be the most effective way to guarantee success globally (Al-Dmour et al., 2021; Alnuaimi et al., 2021; Li et al., 2019; Mashaqi et al., 2020). In the UAE, many companies still rely on information technology systems that are not effective in ensuring that they remain stable and helpful in the event of disasters and faults. Al Shamsi (2019) suggests that various business organizations in the UAE have not been able to update the information technology systems they implemented years ago to ensure that they conform to the needs of the modern age and market (Mehmood et al., 2019). The major challenges hinder the adoption of effective information technology systems capable of remaining stable, operations and efficient even in the face of exposure to risk is cost, lack of knowledge and challenges in linking them to the exact context of

the operations of an organization (Gomez et al., 2019). Like most other corporations and business organizations across the world, those in the UAE are yet to come up with an effective approach to enable them to adopt effective disaster preparedness information systems in their operations.

The study herein reviews the trends and practices of adoption and implementation of a disaster preparedness information system in the UAE. The aim will be to focus mainly on the practices currently in place in most of the businesses across the country. Our research will also review some of the key performance indicators of disaster preparedness information systems i.e. models used for companies' operating within the UAE.

The rest of the paper is structured as follows: Sect. 2 provides the literature review on disaster preparedness and risk models. This is followed by the methodology in Sect. 3. In Sect. 4, the paper will analyze and discuss the results from the study. Finally, conclusion and future work is presented in Sect. 5.

2 Literature Review

The current review of literature considers the issues that scholars have focused on in their studies in their quest to understand IT-disasters, preparedness for adverse events and business continuity during and after IT emergencies in the UAE.

2.1 IT Disaster-Preparedness of Organizations in the UAE

The common feature of modernity all around the world is the reliance on technology systems to accomplish various day-to-day private and public activities (Al Barghuthi et al., 2019). The study indicated that popularity in the use of IT systems in the UAE has made the country vulnerable to attacks (Ali et al., 2022). While the study introduced the causes for concern that business firms should have as they operate in the UAE market, the authors did not address comprehensively the nature of attacks that firms are likely to face as they run their operations in the country. The study by Al Barghuthi et al. (2019) also failed to address the question of the nature of preparation that UAE firms should put in place to guarantee fault preparedness and resilience in the event of an attack (Miller, 2021).

Al Issa (2019) acknowledges that recent disasters have been a major cause for concern for the organizations that have invested heavily in the adoption and utilization of information technology systems in their operations. In his study, Al Issa (2019) indicates that recent disasters, which luckily have been on a limited scale, have demonstrated the nature of issues and complications that they could force firms to go through once they occur (Alshurideh et al., 2020). Unfortunately, Al Issa (2019) study is not clear of the specific steps that the UAE firms should take to ensure disaster preparedness in their IT systems to ensure business continuity during and

after attacks (Aziz & Aftab, 2021). The question must be asked of the way forward including clear guidelines that must be created to guide IT disaster preparedness before an organization adopts specific IT systems in its UAE operations (Aasriya, 2021).

A recent report published by the EIU Digital Solutions (The Economist Intelligence Unit, 2018) rated the levels of preparedness to deal with cyberattacks among the countries that make up the GCC (Alhamad et al., 2021). In the report, it was indicated that Oman and Qatar are the only countries that have high preparedness. It was indicated that Oman and Qatar had a rating of 0, the UAE had a rating of one, Saudi Arabia and Bahrain had 2 and Kuwait had 3 using a scale of 0 to 4 with 0 being highest preparedness and 4 being lowest preparedness (Alzoubi, 2021a, b). At a score of 1, the UAE is somewhat highly prepared as per the findings of the report. However, recent trends have indicated that many businesses in the UAE, and indeed across the world, are rarely investing in the advancement of the disaster recovery systems in their operations (Alzoubi et al., 2020a, b). The question of the reluctance in increasing the budgetary allocations to IT disaster preparedness of the firms operating in the UAE market needs to be covered as extensively as possible, which is also the focus of the study being undertaken herein (AlHamad et al., 2022).

Sharma (2019) reported that most of the businesses have not been keen to increase the budgets for the security and disaster preparedness of their information technology systems. Such a trend indicates that many firms in the UAE are staring at a major risk, which will most likely influence negative outcomes in future (Alnazer et al., 2017). The study by Sharma (2019) leads to the question of whether the failure to increase IT disaster budgets increase the likelihood of emergencies with a firm's operations even as it pursues profitability through cost-saving (Joghee et al., 2020a). The research herein also focuses on the way firms in the UAE can be strategic in funding in disaster preparedness and preparedness of the systems that they use in their operations (Akhtar et al., 2021).

2.2 Disaster Risk Management (DRM) Models

DRM Model are developed to help with risk assessment when developing, deploying, and incorporating disaster preparedness and fault preparedness in information systems. Our study reviews and discusses four of such models (Alzoubi, 2021a, b).

Firstly, the STRIDE model (Spoofing, Tampering, Repudiation, Information disclosure, Denial of Service, Elevation of privilege) identifies the specific form of risk that an organization implementing an IT system is likely to face in its operations (Xin & Xiaofang, 2014). Poniatowski (2018) has criticized the STRIDE model arguing that experienced modelers will only rely on the STRIDE model when seeking to check and confirm if any potential attack is left unaddressed (Alzoubi & Yanamandra, 2020). However, he admits that the STRIDE model is still effective and can be applied to help an organization defend itself and its resources from attackers who

could be keen on affecting its operations negatively (Ali et al., 2021). According to (Khan, 2017), the STRIDE model ought to be taken seriously in the UAE organizations seeking to identify the potential challenges their operations face following the various information technology systems they could be seeking to implement or could have adopted in their operations (Alshurideh, 2022; Alshurideh et al., 2022a, b; Alzoubi & Ahmed, 2019). The question of the applicability of the STRIDE model in UAE organizations and the effects of its application in the UAE is an issue that the current research aims at addressing through the data collected and analyzed (Alzoubi et al., 2020a, b).

Secondly, in IT disaster preparedness planning, it is important to consider a mitigation plan, which should be adopted to ensure that any adverse effects of an attack are addressed as comprehensively as required (Walker et al., 2010). The risk mitigation plan widely accepted in the planning for disaster preparedness involves four key types of actions; accepting the risk, avoiding it, transferring it, and reducing its effects (Herrera, 2013). Herrera (2013) explains that in most cases, IT disasters are often difficult to mitigate when they occur, which means that firms are accepting them by giving up whatever resources affected and creating ways to create new resources. According to Zahid et al. (2020), avoiding the risk involves taking measures to ensure the risk is evaded whenever possible. For instance, an organization facing the risk of its IT system being spoofed can take various measures such as enhancing the levels of security to ensure that attackers find it difficult to intrude and penetrate the layers of security that will be in place (Alzoubi et al., 2020a, b). According to Matthews (2020), the action of risk transfer involves an organization involving the third party to help it fight against the risk it could be facing. In the context of IT risks, an organization can choose to hand over its risks to an IT security firm to enable it to tackle the security and disaster preparedness challenges it could be facing (Mehmood et al., 2019).

Thirdly, the DREAD model has been presented to help firms plan for an effective response when responding to an attack (Suprihanto et al., 2018). The DREAD model has been under the application in various areas that have involved the deliberations of the disaster recovery framework to be adopted whenever an adverse challenge occurs (Czagan, 2014). Once an attack is executed, it is possible to rate various aspects of issues the organization experiences and then consider the strategy and levels of resource allocation to be delivered to help with the resolution of the challenges (Joghee et al., 2020b). The model is summarized the Table 1.

Lastly, the Business Continuity Management (BCM) model has been promoted as an effective approach to ensure an organization minimizes the levels of disruption in its operations following a disaster or a fault in its information technology systems (Torabi et al., 2016). The application of the BCM model allows an organization to address the challenges that emerge as it provides a framework, which involves all the various stakeholders in its operations. According to Vaidhyanathan (2010), the BCM model comprises the following steps:

Step 1—the solicitation of the support of the top leadership of the organization.

Step 2—communicating the business continuity plan to all the stakeholders.

Table 1 A summary of the DREAD model

Item	Description
Damage potential	How expansive is the damage relative to the entire security system of the organization?
Reproducibility	Can the attack be reproducible in the other systems of the organization not affected yet?
Exploitability	Who can exploit the attack? What skills do they have?
Affected users	Who among the stakeholders of the organization is affected by the attack?
Discoverability	How easily did the organization identify the attack? How much damage had been done before the attack was discovered?

Step 3—picking a sponsor to oversee the implementation of the business continuity plan in the operations of an organization.

Step 4—creating an incident management plan and an incident response structure, which will be effective in enabling the business recovery plan and a disaster recovery plan.

Step 5—developing an extensive check and review of the alternative strategy implemented in the previous stage to determine any limitations and gaps that are likely to hinder full operations in the organization.

Step 6—a plan-do-check-act cycle, which will focus on every single issue that could emerge, or be thought of, about the IT system that will be under implementation in the organization post the disaster or attack.

The organizations in the UAE, both public and private, which are at a significantly high risk of experiencing IT disasters and faults must be keen on implementing the BCM model as part of their recovery measures anytime they face such devastating issues in their operations (Ghazal et al., 2021).

3 Methodology

A questionnaire was the preferred tool used for the collection of the data that was analyzed in the current research. The research involved a sample of 62 respondents whose responses were the main basis of the analysis that was undertaken in the current study. The sample was drawn from employees working for both public and private firms in the UAE. The survey resulted in 51 complete responses with 9 incomplete surveys that were eventually discarded yielding an 82% response rate. Given the current state of business activity due to the Covid-19 pandemic, we deemed the response rate to be sufficient for our purpose of study.

The sample was selected using a purposeful sampling technique where we identified specific companies in the UAE to participate in the survey based on their business

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type and nature of the organization. Such techniques have been discussed in the literature and are being widely used for this type of study (Ghane & Esmaeili, 2020; Ghazal et al., 2020; Hodgetts et al., 2020).

Of the 62 respondents initially surveyed, 71% were drawn from the public sector organizations, while 29% were drawn from the private sector firms. The sample population indicate the reality in the UAE business industry where most of the organizations are public sector firms, which are the major contributors to economic growth (Farouk, 2021). The focus was mainly on employees who had information regarding the information systems that their firms were implementing (Lee & Ahmed, 2021).

The first part of the survey focused on the employee perception of whether their organization is prepared for disasters and have a plan in place. The second part of the survey had questions based on the STRIDE model framework and its adoption in the firm. The third part was designed to gauge the trends of application of the DREAD model in the organizations in which the respondents worked (Ali, 2021; Singh & Singh, 2021). It was the expectation of the research that the application of the DREAD model would be an indication of efforts to enhance the levels of disaster preparedness in the organizations in which the respondents worked (Hamadneh et al., 2021). The final part of the survey was designed to gauge the trends of application of the BCM model in the information systems of the organizations. The aim was to understand whether the BCM model, one of the core indicators of disaster preparedness levels of the information systems of an organization, was being employed in the firms that are currently operating in the UAE. Each of their scores were measured on a Likert scale of 1–5, where strongly agree = 5, agree = 4, neutral = 3, disagree = 2, and strongly disagree = 1.

The research was undertaken in strict conformity to the ethical guidelines and principles of scholarly investigation. All the respondents involved in the study were requested to volunteer to provide the required details with guaranteed anonymity. In the event they needed authorization from their firms to comment on the issues raised in the questionnaire, such permission was sought prior to their participation.

4 Results and Analysis

The following table provides a descriptive summary of what the respondents identified as their major observation on the need of having a strategy in place.

Two main observations are made from the summary statistics in Table 2 above. Firstly, all the indices have positive means with the average of 4.2. Secondly, the indices are negatively skewed with a Kurtosis average of 2.6 (less than the normal standard of 3) thus implying the indices behave linearly.

Figure 1 depicts their responses for each of the 5 indices measured.

Figure 1 indicate the factors driving the investments that organizations were putting in place in their disaster preparedness. Clearly, the cost of downtime and the objectives for organizational success, and the risk aversions of technology systems are major driving forces for investments of firms in UAE (Mondol, 2021).

Table 2 Summary statistics on the need for disaster preparedness strategy

	Mean	Std. Dev.	Skewness	Kurtosis
Cost of downtime	4.34	1.0059	−2.082	6.1333
Regulatory/Legal requirements	4.17	0.9399	−1.667	3.7892
Risks to the technology systems of the business	4.25	0.8960	−0.917	−0.1693
Priority of organization's leadership	4.15	1.0210	−1.206	0.9939
Objectives for organizational success	4.09	1.2305	−1.557	2.2645
Average	4.2	1.0187	−1.486	2.6023

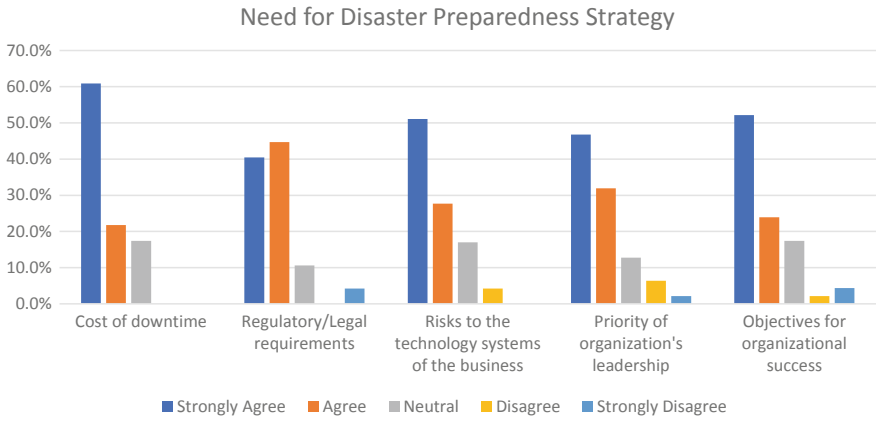

Fig. 1 Mendonca et al., 2019

The study also investigated on the emphasis these firms have placed on the various stages of disaster awareness and mitigation. Majority of the respondents indicated they placed a lot of energy on prevention techniques and strategy as opposed to the recovery efforts. Figure 2 below illustrates this.

The study found that 88.00% of the respondents affirmed that they often consider the likelihood of an IT risk occurring and devastating the systems and operations of their organizations. Moreover, 92% of the respondents indicated that their organizations saw preparedness as an important strategy in their efforts to address the risks associated with IT disasters (Alnuaimi et al., 2021; Alzoubi et al., 2020a, b).

Additionally, the study analyzed some of the disaster risk management models utilized by the different organizations and measured some of the aspects of those models that were under-utilized or considered not effective by each firm. A summary of their responses is provided below.

With regards to the BCM model as highlighted in Fig. 3, many firms don't see the need of identifying a disaster recovery team or creating a new incident management plan that will oversee the implementation of the business continuity plan (Guergov & Radwan, 2021; Obaid, 2021). Instead, it seems that senior staff with their traditional

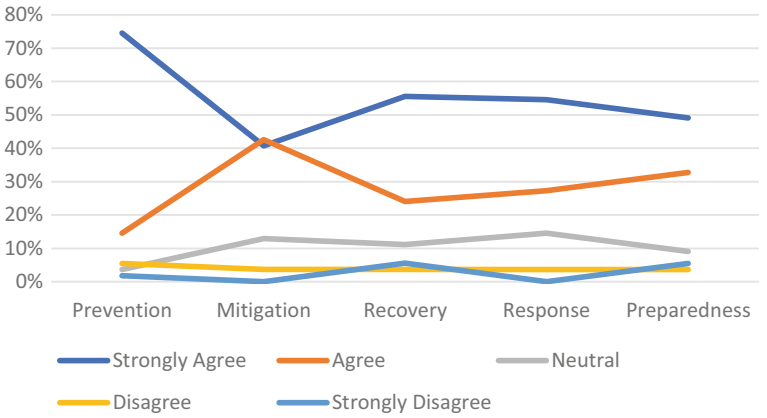

Fig. 2 Disaster awareness and strategy

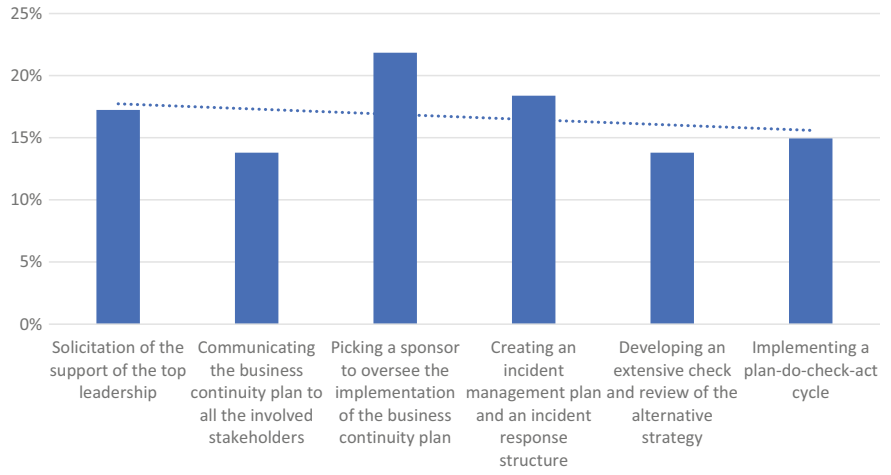

Fig. 3 Aspects of BCM model not followed in UAE firms

managerial roles also take charge of the recovery process. The study also indicated that 86% reported that their organizations were keen on integrating the BCM model to their recovery plan (Alzoubi & Aziz, 2021; Cruz, 2021).

Similarly, Figs. 4 and 5 look at the same issue with relation to DREAD and STRIDE models.

From the figures above, we note that most firms don't focus on the damage potential or exploitability of disasters, whereas information disclosure is highly ignored in the STRIDE model.

When it came to mitigation techniques, a lot of emphasis is put on either avoiding the risk or reducing the risk effect as illustrated in Fig. 6.

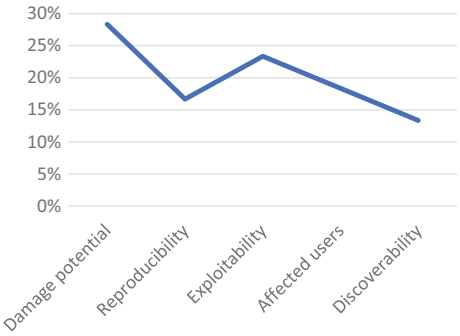

Fig. 4 Aspects of DREAD model not applied

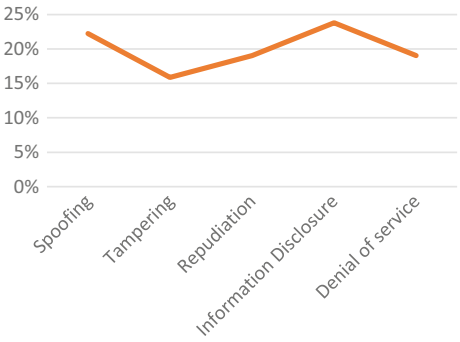

Fig. 5 Aspects of STRIDE model not applied

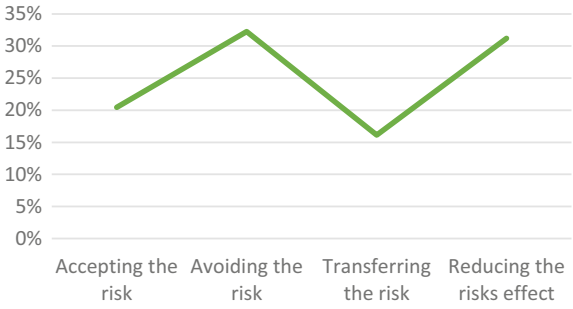

Fig. 6 Common mitigation techniques used

5 Conclusion and Future Work

The objective of this study was to measure the levels of application of the various models of IT disaster preparedness and planning in the organizations operating in the UAE (Lee et al., 2022a, b). The levels of disaster preparedness in the information systems of an organization contribute substantively to the rest of the resources that the firm could be deployed for its business processes and operations (Mehmood, 2021). Some of the organizations have realized the need for such a step, and they are in the

progress of implementing the measures that will enhance the levels of preparedness of their information systems (Alshurideh et al., 2020). The study concludes that many of the organizations in the UAE are taking some measures of prevention, mitigation, recovery, response, and preparedness considering that the respondents rated them highly with an average score of 4.26 out of 5. The data analyzed showed that most organizations are utilizing the DREAD model in enhancing the levels of disaster preparedness in their information systems with the BCM strategy being significantly popular (86% of the respondents indicating their firms are implementing it) in the organizations operating in the UAE (Hanaysha et al., 2021a, b). Given the trend of application of the STRIDE, DREAD and BCM models, it is evident that many of the UAE firms are deploying key performance indicators on their efforts to enhance the levels of disaster preparedness of their information systems (Alnazer et al., 2017; Khan, 2021).

The main limitation of the research was in the low sample size. This is highly attributed to the fact that reaching many of the personnel in charge was difficult during the Covid-19 pandemic (Hanaysha et al., 2021a, b). The findings reported herein may be considered as a steppingstone to future studies investigating some of the best practices used for disaster preparedness and mitigation techniques deployed in the UAE during the pandemic (Khan, 2021).

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Aircraft Turnaround Manager (ATM): A Solution to Airport Operations

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Abstract The set of activities performed during the preparation of an inbound aircraft for the succeeding outbound flight, which are planned for the same aircraft is called turnaround operation. The turnaround operations consist of activities the exchange of passengers for both inbound and outbound, crew, baggage and cargo handling, catering services. The evaluation and control of activities at the present time, is being carried out manually, which lead to flight delays and unreliable data. The proposed solution is to show the aircraft turnaround operations in real time and is based on a rule based systems called Aircraft Turnaround Manager (ATM) that is used to manage and monitor the flight groundwork throughout the turnaround

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_36

process. The Critical Path Method (CPM) and Project Evaluation and Review Technique (PERT) are exhibited in the system. The study has shown, real time monitoring of turnaround operation can decrease delays occurring from operations belongs to airline and can optimize the aircraft ground time.

Keywords Airline operation · Aircraft turnaround process · Flight management · Delay propagation · Real-time monitoring

1 Introduction

Air transport is meant to connect people and cultures across the globe. The worldwide network of transportation that backs up tourism and supports international business is provided by the aviation industry. In addition to this, the world has been exponentially changed by the commercial aviation. It has not only been helpful in facilitating world trade but has also brought the people together. The World's gross domestic product was supported by the aviation industry, which is $2.7 trillion (3.5%). In 2017, airlines transported 4 billion passengers and 60 million metric tons of freight and the cities all over the world are connected with 36,000 routes at one point. The aviation industry has an essential role in boosting the economy as well as generating various financial and social advantages.

Airlines gain income only when the aircraft is flying. Thus, diminishing the non-profitable time spent on the ground is one of the greatest challenges, which aircraft confront nowadays particularly, when the market is oversaturated with business rivalry.

There are stages, where a traveler gone through one after another, and many of the aircraft's turnaround activities have to run in a row, whereas remaining may run in parallel. Theoretically, the aircraft is de-boarded, cleaned, boarded, refueled, supplied with drinking water and food and, if necessary, maintained before the boarding of upcoming passengers. Practically, the procedures are not just interrelated, they are likewise influenced by outside elements, for example, flight changes or climate conditions, which frequently brings about exorbitant changes to the first plan. The aviation business is not only a fast-growing industry, but also a highly competitive one. This is the very reason that it is much necessary for the airlines to use a proactive approach on the major factor of 'punctuality', which resultantly would lead to the satisfaction of passengers as well as specifically results in cost savings per minute.

This punctuality intends to enhance on-time performance. According to a few analysts; On-time performance is the sole largest performance metric in the airlines business. To deal with the turnaround activities, there are no comprehensive automated systems in use at airports at the moment. Generally, airlines have used paper-based procedures for the management of turnarounds. However, this caused inefficiencies. Complex and timely synchronization of a set of activities and services is required to deal with the turnaround of a wide-bodied passenger jet. The sending of key messages required dispatchers to leave the aircraft and run to the gate resulting

in loss of valuable time. Likewise, the central dispatch group couldn't see a real-time status of their turnaround activities. Because of these issues, a framework would be made to adequately manage turnaround operations.

It additionally needed to guarantee that, with airport authorities hoping to better share data between airlines, air traffic controllers, and the airport management, it was in a situation to deliver real-time status info to these stakeholders. This study organizes in a way that first section is of introduction, Sect. 2 discussed the airport operations and airport background, along with current approaches for handling turnaround process. Materials gathered and used methods has been discussed along with the architecture of the system in Sect. 3. However, Sect. 4 presents the overall functionality of the system. The final section summarizes and presents the conclusions derived from this study and provides insight into the future implications.

2 Literature Review

A report released under the head of IATA in 2014 asserted that the number of passengers could touch the limits of 7.3 billion till 2034. This shows a 4.1% average growth rate per year. The increase in massive commute at airports and the surge to follow strict flight schedules will lead to airport congestion that will ultimately pose a challenge to optimum on-time performance (Akhtar et al., 2021; Al Ali, 2021; AlHamad et al., 2022; Alhamad et al., 2021; Ali et al., 2021). The issues will not only be of the congested airport lounges rather the broader airport process shall also bear the strain. Efficiency and effectiveness are the major challenges for the airlines on the day of operation. Efficiency is tested, when each day of the year is to be followed by the same routine, but of course, different schedules. The management has to make sure that the flight operations should run as smoothly as possible.

2.1 Airline Operational Procedures

There is a complicated network of various procedures, which are being performed whether in the air or on the ground. Most of the time, it becomes difficult to predict their effect on one another. As shown in Fig. 1, operational plans are to be developed in two different environments on the day of operations:

- The airline operations control center (OCC), also known as or the integrated operations control center (IOCC) or the systems operations control center (SOCC).
- The hub control center (HCC), also referred to as hub control (HC) or the airport control center (ACC).

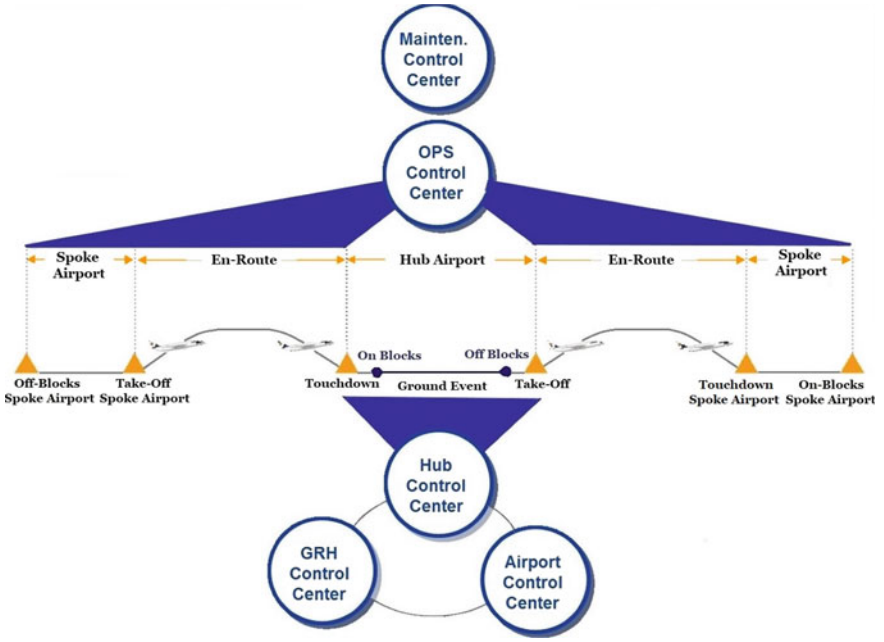

Fig. 1 The Hub management

The second major process deals with the control of on-ground turnaround processes (Ali et al., 2022; Alnazer et al., 2017). Aircraft turnaround details the procedure of servicing an aircraft at the time it is waiting between the two successive flights on the ground. The term of a turnaround states the quick sequence between an arrival and a departure (Alnuaimi et al., 2021; Alsharari, 2021; Alshurideh et al., 2022). However, specifically in long-haul flights, a long-time interval can be programmed between them for many air transport operations. This variation cab was seen in the following figure (ref Fig. 2).

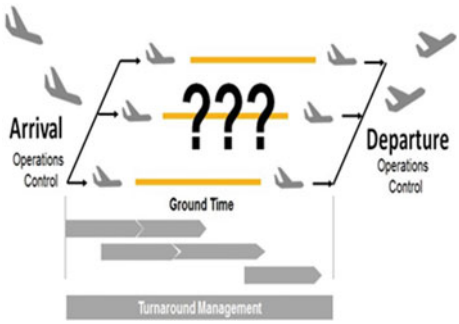

Fig. 2 Turnaround management

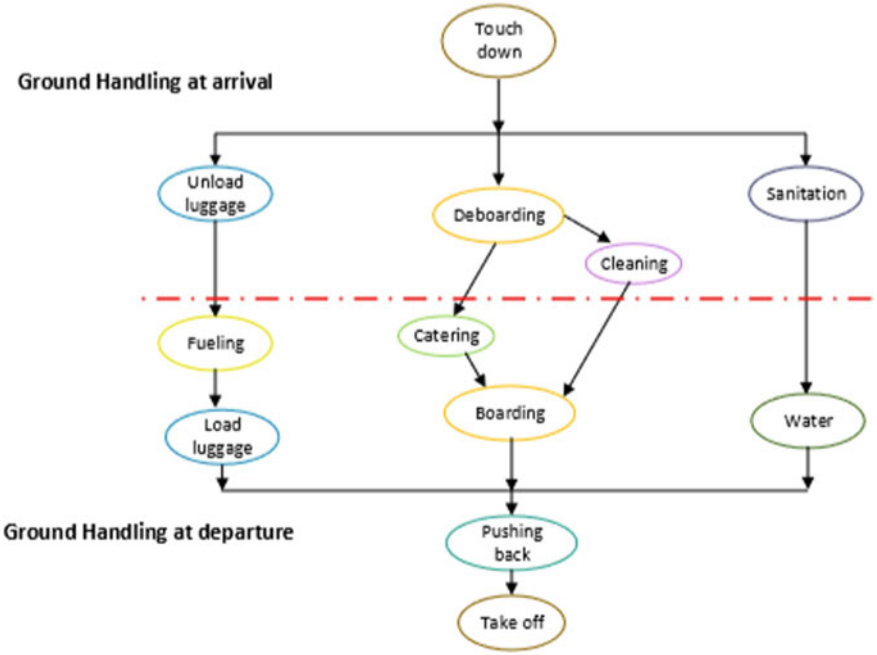

Fig. 3 Ground activities flow

Turnaround involves a set of a complicated process of general ground handling procedures, which an aircraft has to undergo. These activities include boarding/landing, loading/unloading of luggage, catering, fueling, cleaning, sanitizing etc. The major ground handling activities and their precedence constraints around a grounded aircraft are described in Fig. 3. The ground handling tasks of arrival and departure are separately explained.

2.2 Sequence of Ground Handling Activities

While managing the sequence of aircraft ground handling procedures, some activities can be run on their own without considering other activities, but some are dependent on the other ones. The observance of interaction sequence of these ground handling activities is required for a smooth completion of the operations and on-time departure of the plane (Ali Alzoubi, 2021a, b; Asem Alzoubi, 2021a, b; Alzoubi et al., 2022; Alzoubi et al., 2020a, b). The independent ground handling activities may include the front and rear load off-loading with two lower deck loaders as these processes can be initiated and stopped without the involvement of any other activity (Alzoubi & Ahmed, 2019; Alzoubi & Aziz, 2021; Alzoubi & Yanamandra, 2020; Alzoubi et al., 2020a, b, 2021). Rest of the activities must take place in a predetermined set fashion

e.g. cleaning of the cabin and deplane of passengers. Can be seen in Figs. 2 and 3 that these procedures are interlinked, the delay in any of the activity will result in the delay of the next in case no available time exists between the two tasks.

2.3 Critical Path

There are a number of activities at the time of transit/turnaround that can be accomplished only once the preceding activity has been completed (e.g. 'Cleaning' can only be executed till the 'PAX disembarking' not completed), as shown below in Fig. 4.

Critical Path is the longest chain of successive operations. According to IATA principles, unless excessive enhancement in productivity is attained (i.e. time and resources), critical path, which constitutes the minimum transit/turnaround time cannot be further reduced (Aziz & Aftab, 2021; Cruz, 2021; Eli, 2021; Farouk, 2021; Ghazal et al., 2021). Hence, many of the airlines used critical path analysis to identify potential critical paths in turnaround operations.

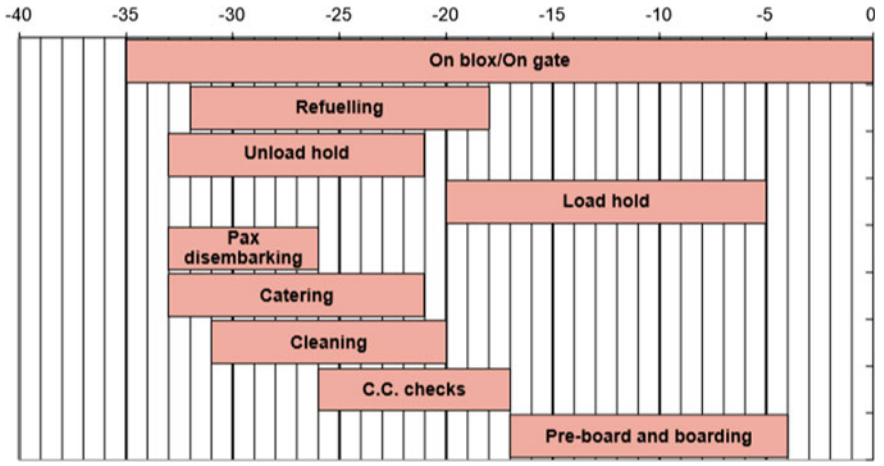

Fig. 4 Turnaround activities

2.4 Current Approaches

To deal with turnaround issues, different researchers' have presented different models. Few approaches have been used for the aircraft turnaround operation: Critical Path Method (CPM), Modeling technique and Monitoring System, Resource-Constrained Project Scheduling Problem (RCPSP). Table 1 depicts the benefits and shortcomings of these approaches.

3 Materials and Methods

This study derives as an applied research, based on an inductive approach. The review of previously published literature including journal and research papers has been performed to acquire the knowledge. This vast analysis aimed to detect maximum possible information about the Precision Time Schedule (PTS) at the current time, along with the determination to identify the sources of data and results that can help to support, enhance and validate the work being done in this study. As mentioned, the findings of this study can be used for the development of the tool, based on the proposed solution and design. ATM will be designed by taking the idea from the techniques of CPM and PERT model. CPM model is widely used to obtain the critical

Table 1 Comparison between different approaches (Author Created)

Approaches	Benefits	Shortcomings
Resource-Constrained Project Scheduling Problem (RCPSP)	– Focused on two operational targets, increasing passenger numbers and delivering punctual turnarounds	– For small aircrafts – Very limited activities – Dynamic handling of activities
CPM model	– Sub-operation activities handled simultaneously – Critical path analysis	– Do not capture the uncertainties of schedule punctuality – Operational uncertainties of aircraft turnaround operations
Markovian type model	– Can handle dynamic and stochastic transitions behavior – Can handle disruptions to aircraft turnarounds	– No buffer times – Very limited activities
Wu and caves analytical model	– Scheduling buffer times – Can handle operational uncertainties	– For small aircrafts – Very limited activities
PERT model	– Describe the interdependencies between some activities – Managing activities in chronological sequence	– Cannot handle dynamic and stochastic transitions behavior

path of the plan (Guergov & Radwan, 2021; Samer Hamadneh et al., 2021a, 2021b; Hanaysha et al., 2021b). It can be a project plan or a process, which has many tasks involved and the tasks are dependent on each other (Hanaysha et al., 2021a; Joghee et al., 2020; Kashif et al., 2021). The objective of using CPM model is to detect the critical path of the activities involved in turnaround process, the management of activities in a sequence has been inherited from the PERT model. Above, in the study, the activity sequence diagram, where a Path shows the arrangement of activities that must be executed in a sequence. A Use case methodology has been used for system analysis to be classifying and clarifying the complete system requirements.

The subsequent section will elaborate the structure and overall architecture of the system. The proposed architecture has been designed based on PERT and CPM model techniques. Further in the study includes more details on the model application using use cases.

3.1 ATM Structure and Flow Development

The control flow and structure has been elaborated in current section. Figure 5 demonstrates the proposed complete control flow and data flow in the different system functions.

The Aircraft Turnaround Monitor (ATM) is designed to gather functional data in real time through aircraft turnaround process. The system will also be used for real time monitoring by using the gathered information. The ATM framework is designed as open framework due to operational and different ground handling unit needs, which gives the capability to add on modules based on ADD¡ITIONAL requirement on the same structure and platform (Alshurideh et al., 2019; Khan, 2021; Lee & Ahmed, 2021; Lee et al., 2022a). According to most of aircraft PTS's, turnaround activities can be categorized in four process flows, specifically passenger, engineering, cargo and catering (Ghazal, 2021; Maasmi et al., 2021; Siddiqui et al., 2021). The framework includes the activities with respect to each process flow according to data collection needs and based on importance of specific activity involved in turnaround process. On the basis of this framework, each specific event handler will require to gather the timestamps of main activities during the process of turnaround that enables every specific process flow progress shared between control unit and the handler, e.g. catering center and catering loading staff. Meanwhile, the same information collected during turnaround operation can be shared amongst various handling units involved in turnaround process, the Airport Operation Control Center (AOCC) and the Network Operational Control Center (NOCC) at the airlines headquarters (Hamadneh et al., 2021a, 2021b; Lee et al., 2022b; Mehmood, 2021; Mehmood et al., 2019; Miller, 2021). The accessibility of real time operational data along with turnaround operations transparency significantly raises the situation awareness of all ground handling units and AOCC, NOCC involved in aircraft turnaround process. In the turnaround process some of the activities have operative sequence that needs to be followed, such as, passenger, cargo, and catering flows (Zitar, 2021; Zitar et al., 2021). The rest of

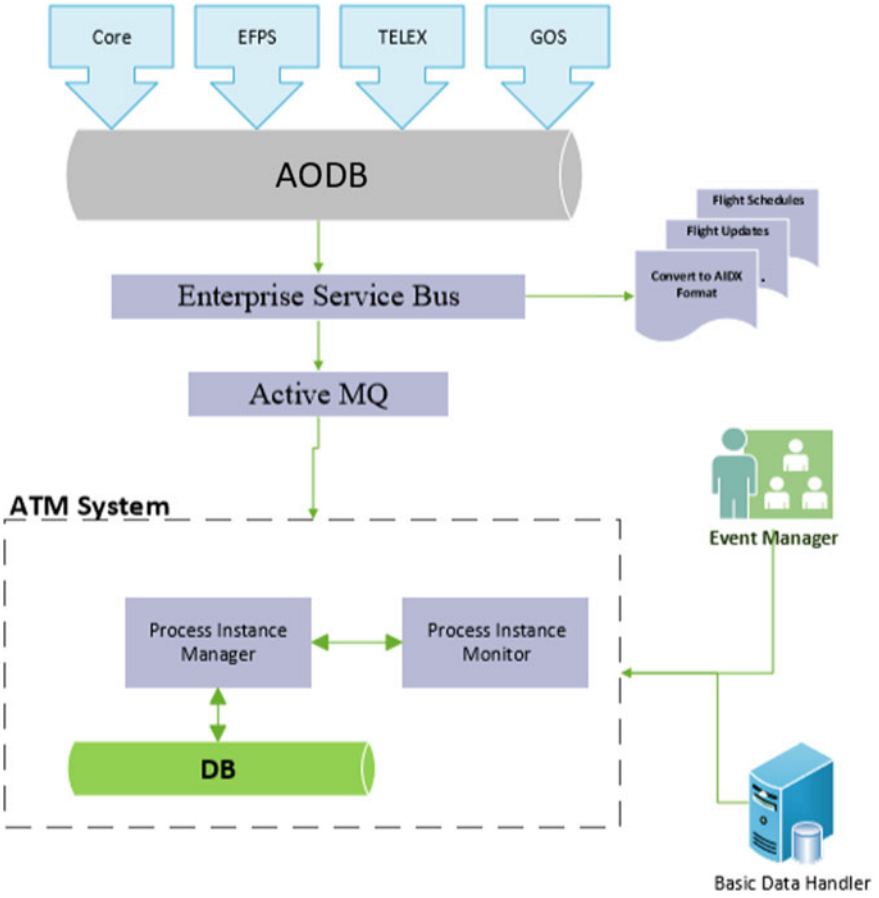

Fig. 5 Proposed ATM architecture

the activities, such as, engineering checks and refueling are executed autonomously from others.

External Systems: Core, EFPS, TELEX, GOS etc. these systems are the source of data, which updates information for each flight. Every system is responsible for specific type of data and information e.g. the Aircraft Actual Landing time is captured by EFPS system and it has been sent directly to AODB.

3.1.1 Airport Operational Database

Airport Operational Database (AODB) is called the heart of an airport. It stores all flights information and process each update received from different sources for specific flight. Airport has dozens of systems, which are connected to AODB. Airport

operational control center is directly connected to AODB and monitoring and maintaining to dispatch each flight (Mondol, 2021; Obaid, 2021; Radwan & Farouk, 2021; Shamout et al., 2022). As AODB is central database for airport, it also shares the information to other systems, which are dependent on flight updates. Some of the systems require data in real time from AODB and some can work with latency, like the touch down time is required to open the GATE for passengers. If the touchdown time is not sent in real time the GATE opening for passengers will be delayed. The ATM system also requires the flight information in real time from AODB (Al-Dmour et al., 2021; Al-Dmour, 2016; Al Hamadi et al., 2017; Al Neaimi et al., 2020; Alshurideh et al., 2021).

3.1.2 Enterprise Service Bus

Enterprise Service Bus is used to send data, to and from the two systems. ESB works as broker and takes data from one source, change it to AIDX format, place it in the relevant queue from, where destination system picks and process the information. ATM system will pick and process the flight information from AODB that will be delivered by ESB in the Active MQ. Additionally, ESB will send daily flight schedule at configured time to ATM and real time flight updates as well for the flights lie within current time +7 days window (Al-Dmour & Teahan, 2005; Al-Hamadi et al., 2015, 2021).

3.1.3 Aircraft Turnaround Manager (ATM)

ATM will consume all the flight details from the queues, which then update the flight status moreover the event manager assigned to each specific flight initiate sending the activities messages for the respective flight from a handset. All event timings can be visible to all handling units and event managers, so that in case of any criticality they can take proactive measures (Al-Naymat et al., 2021; Ali & Dmour, 2021; Aslam et al., 2021; Bibi et al., 2021).

4 Results and Findings

After discussing the flow of the system, this section will emphasis on the functionality part of the system and will elaborate each function with the help of narrative use case.

Functionality Definition

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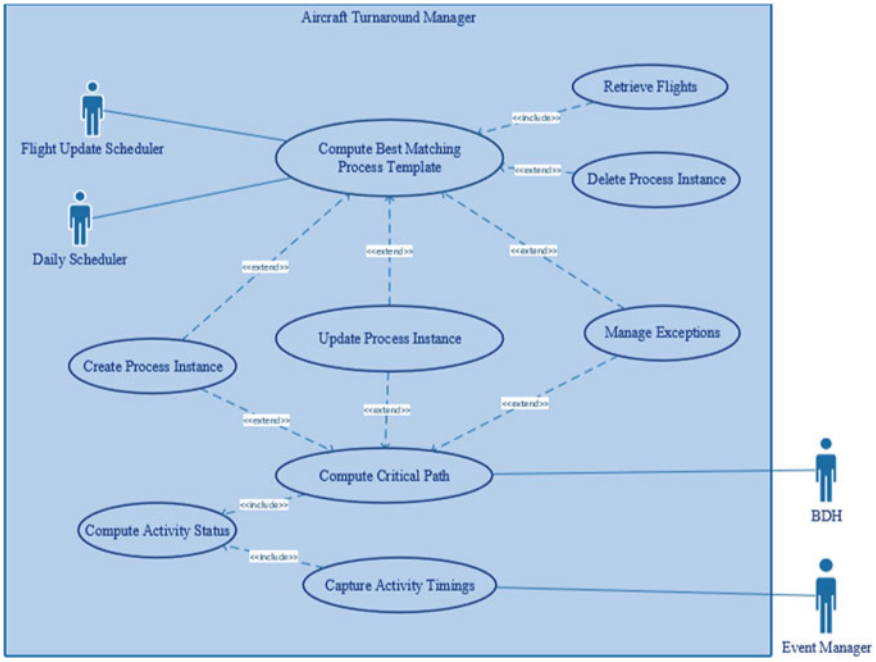

Fig. 6 Functionality diagram *(Author created)*

4.1 Manage Processes Instance—Use Case (High Level Use Case)

Figure 6 below shows proposed function diagram.

(a) Compute Best Matching Process Template—Use Case

Users

- Daily Scheduler
- Flight Update Scheduler

Pre-Conditions

- The configured Daily Scheduler threshold is reached: {Daily Instantiation Time} {Daily Instantiation Time Zone}
- The Flight Update Scheduler threshold is reached (every {Flight Update Frequency})

Post-Conditions

- Flights are either:
  - Not associated to a process instance (if no process template is applicable)

- Associated to a process instance (if at least one process template is applicable)

In case a flight is associated to a process instance, alert status and delay of each activity is refreshed.

Description

First the system invokes the <*Retrieve Flights*> use case with the following parameters depending on the scheduler triggering the use case:

– [Current time, Current +6 h] for the Daily Scheduler
– [Current time, Current time +2 h] for the Flight Update Scheduler

For both Daily Scheduler & Flight Update Scheduler, the process execution will be the same as defined below. For each arrival, departure or turnaround flight returned by the < *Retrieve Flights*> use case, the rule engine matches the following criteria with the flight information:

– Aircraft type
– Type: Arrival, Departure, or Turnaround

If the system will not find any match between flight details and any of the set of application rules, no new process template will be selected.

Else the new process template will be set to the process template having the best matching applicable rule (i.e. having the most criteria matching the flight attributes).

If no new process template is selected and a current process instance is set on the flight, the < *Delete Process Instance*> use case will be invoked.

Else if the system detects one of an exception based on the flight data, the < *Manage Exception* > and < *Compute Critical Path* > use cases will be invoked.

Else if a new process template is selected and the flight has no associated process instance, the < *Create Process Instance* > and < *Compute Critical Path* > use cases will be invoked.

Else If a new process template is selected and the current process instance set on the flight derives from a different process template the < *Update Process Instance* > and < *Compute Critical Path* > use cases will be invoked.

Since the computation of the critical path entails the update of activities earliest start/end time (against which delay value is computed) and latest start/end time (against which the severity of the delay is evaluated), the system then invoke < *Compute Activities Delay* > to refresh delay and associated severity for each activities.

(b) Retrieve Flights—Use Case

Users: N/A

Pre-Conditions: N/A

Post-Conditions: A set of selected flights containing arrival, departure and turnaround flight will be returned.

Description

The system selects arrival and departure flights based on:

– Best arrival timing (Arrival Flights)
– Best departure timing (Departure Flights)
– The time window as provided in input of the use case

For each selected flight the following processing will be performed:

The aircraft split time is defined as the sum of the Minimum Turnaround Time (MTTT), as defined in Basic Data Handler (BDH) and {Split Time Buffer}, as configured in PTS per aircraft type.

If a flight linkage exists, and departure flight's best departure timing minus arrival flight's best arrival timing is less than the aircraft split time, the system adds the *turnaround* in the set of selected flights.

Else if a flight linkage exists, and departure flight's best departure timing minus arrival flight's best arrival timing is greater than or equal to the aircraft split time, the system respectively adds the *arrival* and *departure* flight to the set of selected flights as separate entities.

Else If no flight linkage exists, the system adds the *arrival* or *departure* flight to the set of selected flights as separate entities.

The system then excludes the flights for which no further processing is needed (cancelled, off-block flight) as follow:

– Departure flights that are either cancelled or off-block
– Arrival flight that are either cancelled
– Turnaround flight that are fully cancelled (i.e. both arrival and departure in cancelled status) or off-block
– Turnaround flight for which either its arrival or its departure is cancelled

In the last case, the non-cancelled part of the turnaround flight will be added to the list of selected flight as a separate entity (*arrival or departure).*

Ground flight movements (tows) are not considered as flights or part of a turnaround.

(c) Create Process Instance—Use Case

Users: N/A

Pre-Conditions: A new process template has been selected for the flight

Post-Conditions: The flight is associated with a process instance

Description: The system instantiates the process template for the flight. Each activity and their characteristics are associated to the flight.

(d) Update Process Instance—Use Case

Users: N/A

Pre-Conditions

– A new process template has been selected for the flight.
– An existing process instance exists for the flight.

Post-Conditions

- The flight is associated with a process instance.
- Actual start time and actual end time of common activities between current and new process instance will be preserved.

Description

The system looks up for any existing activity present both on process instance associated the flight and on the process template to be applied. Selected activities actual timings will be preserved. Other existing activities and relationship are deleted.

Note that this copy of an activity actual timing(s) also applies in the case a turnaround is split into an arrival flight and a departure flight, and vice versa:

- In case an activity is present in both the turnaround existing process instance and in the new process instance of the arrival and/or the departure, actuals will be copied for this activity.
- In case an activity is present in both the process instance of arrival and/or the departure flight and in the turnaround new process instance, actuals will be copied for this activity.

The associated actual timing information are thus preserved for common activities between the existing and new process template.

(e) Delete Process Instance—Use Case

Users: N/A

Pre-Conditions

- No new process template has been selected for the flight.
- An existing process instance exists for the flight.

Post-Conditions: The flight is not associated to any process instance.

Description

The system deletes any process instance associated to the flight.

(f) Manage Exceptions—Use Case

Users: N/A

Pre-Conditions

- A new process template has been selected for the flight
- An exception has been detected for the flight (Aircraft Change, Bay Change or Gate Change)

Post-Conditions

- The flight will be associated with a process instance.

– Actual start time and actual end time each activity will be updated as per system configuration
– Former activities in reset status will be attached to the process instance

Description

In case an exception is detected, the system first instantiates the new process template for the flight. Each activity and their characteristics are associated to the flight.

In a second step, each activity actual will be revisited according to the system configuration (exception triggered, activity action). For each exception, the system allows the user to specify one of the following behaviors per exception:

– Reset

  - If the activity was also present in the former process instance, and if any actual time was present (activity started/finished), the former activity will be attached to the new process instance, without link to any of the associated activities of new process instance. Its status will be flagged as 'STOPPED'.
  - The activity present in the new process instance is not updated with any actual (status remains 'planned')

– Fetch from flight:

  - If the activity was also present in the former process instance, and if any actual time was present, the actual times are transferred to the new activity. Previous activity is discarded.

– Fetch from aircraft:

  - If the activity was also present in the former process instance, and if any actual time was present (activity started/finished), the activity is stored against the former registration for further re-use in a pool.
  - The system looks for any activity stored in the pool or, on a flight associated to the same registration which is still on ground. This only applies if the activities actuals are fully included in the exception window (between current time minus {Exception Window Start} and current time plus { Exception Window End})

The last step of exception management consists in applying exceptional activities according to the system configuration (exception triggered, exception activity, exception condition). These are templated activities that apply on specific exceptions and additional conditions. These additions to the process template include the new activities needed to carry out flight processes as per exception procedure.

– E.g. 'Passenger disembark, 'Passenger transfer from previous gate'
– E.g. 'Transport GPU from previous bay', Etc.

(g) Compute Critical Path—Use Case

Users: NA.

Pre-Conditions

- A process instance is applied to the flight.
- A best departure time is set for the turnaround or departure flight
- A best arrival time is set for the turnaround or arrival flight

Post-Conditions

- A earliest start and end time will be set on each activity
- A latest start and end time will be set on each activity

Description

Computing the critical path consists in identifying, for each activity:

- The earliest start and end time achievable depending on the flight arrival time based on all predecessor activity duration
- The latest start and end time of the activity has to meet in order to enable the flight to depart on time.
- In order to achieve this computation, the system sets the reference end time of the process as follow:
- Reference end time is set to best departure time for turnaround and departure flights.
- Reference start time is set to the best arrival time for turnaround and arrival flights

The system then computes the *earliest* start and end times of activities in sequence from the *start* to the *end* of the process for all the activities linked directly or indirectly to the start of the process (flight arrival) as follow:

- Earliest start time of an activity is the earliest achievable time for this activity to start considering all predecessor activities earliest end times and associated link lag.
- Earliest end time is set to the earliest start time plus activity duration.

The system also computes the *latest* start and end times of activities in sequence from the *end* to the *start* of the process for all the activities linked directly or indirectly to the end of the process (flight departure) as follow:

- Latest end time of an activity is the latest possible time for this activity to end not endangering any successor activities latest start times and associated link lag.
- Latest start time is set to the earliest start time plus activity duration.

For the activities that are not connected to the start of the process, the above mentioned calculation does not provide any earliest time. The systems by default set earliest start/end to latest start/end time. This case typically happens for departure flights, where no reference start time is set by the system but might also happen for turnaround activities not related to the start of the process. For the activities that are not connected to the end of the process, the above mentioned calculation does not

provide any latest time. The systems by default set latest start/end to earliest start/end time. This case typically happens for arrival flights, where no reference end time is set by the system but might also happen for turnaround activities not related to the end of the process.

The system does not support activities that are not connected neither to the start nor the end of the process.

(h) Capture Activity Timings—Use Case

Users

– Event Manager

Pre-Conditions

– An event is detected by the Event Manager.
– The concerned flight exists and the corresponding activity is associated to the flight.

Post-Conditions

– The current activity is set with an actual start and/or end time.
– Successor activities are set with estimated earliest start and end time.

Description

The Event Manager parses incoming external interfaces messages and identifies:

– The concerned flight
– The concerned activity
– The actual start or end time of the activity (if a condition start or condition end is triggered for the activity
– If a reset condition is triggered for the activity

In case the concerned flight is not found, or if no process instance exists for this flight, or if the activity is not part of the process instance of the flight, the message is discarded.

If a reset condition is detected, actual timings pertaining to the activity (start, end or both as identified in the message) are removed from ATM system.

Else if a start condition is detected, the actual start time is added to the activity and system then re-evaluates the current activity estimated end time satisfying its duration.

Else an end condition is detected; the actual end time is added to the activity.

In any of the above mentioned case, the system then re-evaluates all successor activities with an estimated start and estimated end, satisfying their successive relationship offset and duration.

The system then invokes the < *Compute Activity Status* > use case for all updated activities.

(i) *Compute Activity Status*—Use Case

Users: N/A

Pre-Conditions

- Earliest Start and End Time are set on the activity
- Latest Start and End Time are set on the activity

Post-Conditions

- Delay value will be set on the activity
- Alert status will be set on the activity

Description

The system sets the alerts status and associated delay for each activity depending on the timings associated to the activity. As a general rule, the delay value of an activity is always computed versus the earliest possible times. The alert severity depends on the latest times (critical if latest time is breached, non-critical otherwise).

The following section describes the applicable scenarios for each alert status:

- Not Set (PTS in the future)
- Started (PTS started and no issue)
- Finished (PTS finished)
- Non-critical alert (PTS is delayed but no impact to an on-time departure)
- Critical alert (PTS is delayed and impacts an on-time departure)

The alert status is '*Not Set'* (PTS in the future) in the following scenarios, as shown in Table 2:

The alert status is '*Started—No Alert'* (PTS started and no issue) in the following scenario, as shown in Table 3.

The alert status is '*Finished–No Alert'* (PTS finished) in the following scenario, as shown in Table 4.

The alert status is '*Non—Critical Alert'* (PTS is delayed but no impact to an on-time departure) in the following scenarios, as shown in Table 5.

Table 2 Alert Not Set *(Authors created)*

Scenario	Conditions	*Delay*
PTS instance is present on the flight but not started (no actual timings received for any activity)	– No actual start time is present on the activity – No actual end time is present on the activity – No estimated start time is present on the activity – No estimated end time is present on the activity	0
PTS instance started (at least one actual timing is received for one activity), and the current activity is estimated as not delayed	– Estimated end time is set on the activity – Estimated end time is before earliest Start time	0

Table 3 Started–No Alert *(Authors created)*

Scenario	Conditions	Delay
Activity is started on time	– Actual start time is set on the activity – Actual end time is not set on the activity – Actual start time is before earliest start time	0

Table 4 Finished–No Alert *(Authors created)*

Scenario	Conditions	Delay
Activity is completed on time	– Actual end time is set on the activity – Actual end time is before earliest end time	0

The alert status is '*Critical Alert'* (PTS is delayed and impacts an on-time departure) in similar scenarios, except that flight departure time is impacted, as shown in Table 6.

5 Discussion and Future Work

This research unveils that main objective of an Operation Control Center of any airline to uphold the declared flight timetable, so that the flight departs at its scheduled timing diminishing delays and obstacles if occurred during the flight operations. Therefore, transparency of all activity status during flight turnaround operations is to give the complete picture to Operation Control Center. It empowers the OCC to efficiently take swift and suitable decisions about to face any complication to the flight schedule, detect responsibilities and asses' performance regarding all involved activities. In the past days the assessment and control of these activities has been performed by telephone communication and manual procedures, due to human interference it made the data doubtful and lead to delays and unreliable information. Hence, to achieve high OTP the real time turnaround activity monitoring is necessary. Airlines do their best to achieve good OTP, a flight depart on the announced time means a good OTP, which has a major impact on service quality to passengers, airline reputation and economy of the airline. The solution offered in this study has presented a system for aircraft turnaround process management and monitoring. CPM and PERT models were used to manage turnaround activities by obtaining critical path and critical activities including passenger handling, cargo, engineering checks and catering services.

For the later stage, the proposed system can accept more functionality and extend to numerous directions. Currently the alerts are generated and are shown on the monitoring screen; this can be extended to send SMS messages to the concerned flight coordinator or handler. With current solution every handler has to update the start and finish time of activity from handheld device, this can be extended to use barcode reader to update the timings, which will switch to full automation of activity

Table 5 Non−Critical Alert *(Authors created)*

Scenario	Conditions	Delay
PTS instance started (at least one actual timing is received on any activity), and current activity is not started but estimated as delayed. However, it does not impact the departure time	− Actual start time is not set on the activity − Actual end time is not set on the activity − Estimated end time is after earliest end time − Estimated end time is before latest end time or activity is not on the critical path	Estimated end time minus earliest end time
Activity is not started and the current time is after estimated start time. However, it does not impact the departure time	− Actual start time is not set on the activity − Actual end time is not set on the activity − Current time is after the earliest start time − Current time is before the latest start time or activity is not on the critical path	Previous value
Activity is started and completion is estimated as delayed. However, it does not impact the departure time	− Actual start time is set on the activity − Actual end time is not set on the activity − Actual start time is after earliest start time −Actual start time is before latest Start time	Estimated end time minus earliest end time
Activity is started, not completed and the current time is after estimated end time. However, it does not impact the departure time	− Actual start time is set on the activity − Actual end time is not set on the activity − Current time is after the earliest end time − Current time is before the latest end time or activity is not on the critical path	Previous value
Activity is completed and delayed. However, it does not impact the departure time	− Actual end time is set on the activity − Actual end time is after earliest start time − Actual end time is before latest Start time	Actual end time minus earliest end time

times. Even though the mobile devices can work to get the operational data during turnaround process still it needs human interaction for transmission of data, which add additional burden to agents which are handling the ground events. To minimize this manual intervention automated procedure can be added using RFID tags.

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Table 6 Critical Alert *(Authors created)*

Scenario	Conditions	Delay
PTS instance started (at least one actual timing is received for any activity), and current activity is not started but estimated as delayed. It does impact the departure time	– Actual start time is not set on the activity –Actual end time is not set on the activity – Estimated end time is after latest end time	Estimated end time minus earliest end time
Activity is not started and the current time is after estimated start time. It does impact the departure time	– Actual start time is not set on the activity – Actual end time is not set on the activity – Current time is after the latest start time	Previous value
Activity is started and completion is estimated as delayed. It does impact the departure time	– Actual start time is set on the activity – Actual end time is not set on the activity – Actual start time is after earliest start time – Actual start time is before latest Start time	Estimated end time minus earliest end time
Activity is started, not completed and the current time is after estimated end time. It does impact the departure time	– Actual start time is set on the activity – Actual end time is not set on the activity – Current time is after the latest end time	Previous value
Activity is completed and delayed. It does impact the departure time	– Actual end time is set on the activity – Actual end time is after latest end time	Actual end time minus earliest end Time

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Information Systems Solutions for the Database Problems

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Abstract This paper has attempted to build on an explanation of solutions for database problems in information systems. The main focal area for this paper is majorly on enterprise resource planning systems and their effects and characteristics that make them a primary software tool which is used by businesses worldwide whether they be at large scales or work at smaller scales compared to the big-name enterprises out there. The paper has given a basic introduction into what an enterprise resource planning system is and defined its key characteristics that make it exactly an ERP. It also points out how businesses and enterprises make use of such systems and the methodologies that they use to implement ERP systems into their business practices. This paper also attempts to characterize ERP in relation to the solutions that they provide for the specific industry that they are used in. This is

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_37

mostly done through categorizing the ERP through characteristics such as according to size, technology, risk factor, cost effectiveness and more.

Keywords Information systems solutions for the database problems · Enterprise resource planning systems

1 Introduction

Enterprise resource planning (ERP) is a core enterprise software and solution stack comprised of a central database surrounded by multiple plug-in services and software packages, each of which are designed and made to solve specific enterprise problems and address specific challenges. There are a multitude of various processes that are essential to the running of an enterprise business. These processes include skills and techniques such as inventory management, customer relationship management, human resources, accounting and more (Akhtar et al., 2021; Al Ali, 2021; AlHamad et al., 2022; Alhamad et al., 2021; Alshurideh, 2022). To put it simply, ERP management software integrates these various functions into one complete software package system. This is done in order to streamline processes and information across the entire business and enterprise organization (Al Kurdi et al., 2020a, b, c; Hamadneh et al., 2021a, b; Tariq et al., 2022). For and ERP system to function to its maximum and full capability, the ERP system needs to involve a shared database that supports multiple functions used by different divisions (Ali et al., 2021, 2022; Alnazer et al., 2017; Alnuaimi et al., 2021). An example of this would be the human resources department only being reliant on the information that is specific needs.

ERP is valuable as ERP systems are able to tie together a multitude of different business processes and enable the flow of all the data that is required for the business between them. In this day and age ERP systems are critical for medium to large size businesses (Alsharari, 2021; Alshurideh et al., 2020a, b, c, 2022; Alzoubi, 2021a) and enterprises if they wish to manage the thousands of data driven systems that they require to function properly and efficiently. To the businesses and enterprises that make use of ERP systems, it is an indispensable tool for them. Being able to align separate departments and improve day to day workflow is almost viewed as an essential practice for the enterprise market (Alzoubi & Yanamandra, 2020; Alzoubi et al., 2020a, 2022; Alzoubi, 2021b). This is due to the fact that ERP is a critical enterprise software that is able to collect information from different departments in a common database, making it easy to monitor and understand. ERP systems are able to generate major financial saving and as well as time savings as they are able to provide the organization insight into the processes and reveal opportunities for growth. There are many ways for ERP systems to be implemented into business practices (Alzoubi et al., 2021; Alzoubi & Aziz, 2021; Alzoubi et al., 2020b; Alzoubi & Ahmed, 2019). These include cloud based systems, onsite premises systems and it is also possible to include a hybrid of both the cloud an onsite system in one. In recent years cloud based ERP system services has seen the larger and more substantial rise in practice and

popularity (Aziz & Aftab, 2021; Cruz, 2021; Eli, 2021; Farouk, 2021), however which approach an enterprise or business adopt into their working environment depends on the certain and specific needs of the company and their work culture. Enterprises should take importance to understand the integration needs and requirements, the methods of implementation, the different capabilities and benefits of each and the total cost of each different system before choosing to which one they wish to take into effect (Ghazal et al., 2021; Guergov & Radwan, 2021; Hamadneh et al., 2021a, b; Hanaysha et al., 2021a, b).

Companies across every industry, with diverse business models, have come to term with the benefits that come with utilizing ERP systems. ERP has been seen to be used in a multitude of industries and businesses such as educations, health and beauty, manufacturing, IT services, retail, food and beverage and many more. There are a few fundamental features that make an ERP system distinguishable from other types of software (Maasmi et al., 2021; Siddiqui et al., 2021; Zitar et al., 2021). These traits, in their most basic form, are having a common database, a consistent UI, business process integration, automation and data analysis. As an all-inclusive source of data, ERP systems also provide a number of reports and analytics that can be the clear difference makers in the working of a business. Turning the influx of data into comprehensible models makes ERP capabilities invaluable.

2 Characterization of ERP Solutions

Numbers of ways are available for characterization for ERP solutions-by the supplier's stake in the market, by the solution's size, and by the specific industry, the system is made for the sustenance of, or according to its working technological stage.

According to Size: Oracle and SAP are two other leading examples of ERP systems based on size-they're responsible for more than half of the total investments on ERP, expenditure, globally. Trailed by Consona, CDC, Microsoft (Dynamics AX and Dynamics GP), Epicor, QAD, Infor (VISUAL, SyteLine, and many other solutions) among others (Hanaysha et al., 2021a, b; Joghee et al., 2020; Kashif et al., 2021; Khan, 2021).

According to Technology: Positioned on operational setting (database/ hardware/ operating system), previously there were considerable distinctions in ERP solutions they worked on. Due to the global application of Windows and web-based architecture, there has been a notable loss of division (Alshurideh et al., 2019, 2020a, b, c; Al Kurdi et al., 2020a, b, c). Nevertheless, database and server problems can be classified using ERP solutions, although many solutions can be implemented in different environments. Mainframe systems, intel/window platforms, UNIX are worked on by versions of products of SAP, for example.

3 Application Analysis

Certain factors must be kept in mind when choosing a proper ERP system specifically:

Benefit Factor: These are those features of the ERP system which widely manage the system's ability to understand and align various departments' operations across various locations. Since the UN has an office in each country that is a member, it's particularly related in this case. Comprehending these departments' operations and synchronizing them can have an effect on its successful action that is a negative (Aslam et al., 2021; Bibi et al., 2021; Ghazal, 2021).

Satisfaction of Executive: It discusses the fulfillment of expectations relating to ERP system's expectations as described by the top-level managers or the executives of an organization.

Satisfaction of Employee: This requirement also discusses the ERP system's ability to fulfill the needs of the employees, like the previous point, given works relating to the chosen systems of ERP. It's essential to remember that this factor could either make or destroy the ERP system's success rates. This is inclusive of user-friendliness and the easy operation of the system.

Risk Factor of Business: Recognizing different factors connected with the application of the project of ERP (enterprise resource planning). A few of the challenges are of the business procedures regarding restructuring to the procedures followed by the ERP software, investing in recruiting and employing professionals of IT, the hurdle of seeking external individuals, and conforming their technical proficiency and knowledge with the fundamental teams and the possibility of technological bottlenecks (Lee & Ahmed, 2021; Lee et al., 2022a, b; Mehmood, 2021).

Cost-benefit and cost-effectiveness: If ERP can be indicated by business risk factors and the benefit factor which is essential to highlight, the different prices laid out for testing, implementation, customization, and purchase of an ERP system, with least investments monetarily is known as the cost-effectiveness of ERP (Zitar, 2021).

User friendliness: The next thing observed was that the user-friendliness of the ERP system can be indicated by the satisfaction of executives and employees. The user-friendliness of an ERP system is studying the ease in its operations or interaction in its solutions. When the answers are easy to configure, intuitive, integrated, graphical, and visual, it is always more beneficial. Hence the picture below gives us an idea of the present scenario of ERP (Fig. 1).

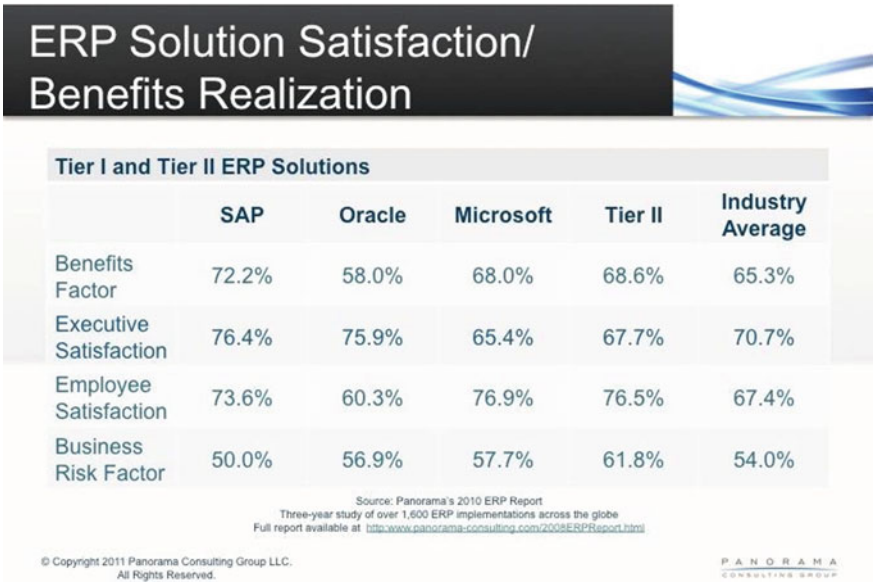

Fig. 1 Choosing the right ERP. *Source* Panorama's 2010 ERP Report. Accessed on Dec-2021. Available at https://www.panorama-consulting.com/wpcontent/uploads/2016/07/2010-ERP-Vendor-Analysis-Report.pdf

3.1 SAP ERP

One of the main organizations to develop the possibility of individual projects was SAP while getting information from normal databases that can be procured, introduced, and implemented autonomously. With an extended past of more than 4 decades and around 50,000 establishments in roughly 50% of 1000 organizations of the world's Fortune, SAP is a solid supplier of administrations that has advanced and adjusted to alterations (Mehmood et al., 2019; Miller, 2021; Mondol, 2021).

Following are the key focal points related to SAP programming:

- SAP can undoubtedly tweak their product to fit the requirements of any industry because of its broad involvement with the field. For example, it tends to be implemented to assembling, acquirement, administrations, accounts, and even intergovernmental associations.
- The significant advantage of SAP ERP is its exceptional coordination with different business modules that aren't there for contender programming projects like BAAN and Oracle.

1. It empowers less complex worldwide combination conquering issues like language, cash conversion scale, and culture
2. It gives continuous data
3. It diminishes the likelihood of having excess data

3.2 Oracle ERP

If Consultancy offerings, industry verticals, functional and technical are combined by the Oracle ERP systems by ERP solutions, into one understanding organization aka Oracle E-business Suite as shown in Fig. 2. It merges and assembles offshore, onsite and offsite activities of a firm to shorten the ease of the burden of operations that are integrated. Various functions like business intelligence analysis, aids in the management of CRM, and HR and financial calculations are performed by it. Technical functions are carried out and format for forms and reports are provided that help the organization's workflow systems and QA Frameworks (Alhashmi et al., 2020; Almaazmi et al., 2020; Alshurideh et al., 2020a, b, c; Obaid, 2021; Radwan & Farouk, 2021; Shamout et al., 2022). It aids in the backup of media functions, retail, insurance, and manufacturing and maintenance.

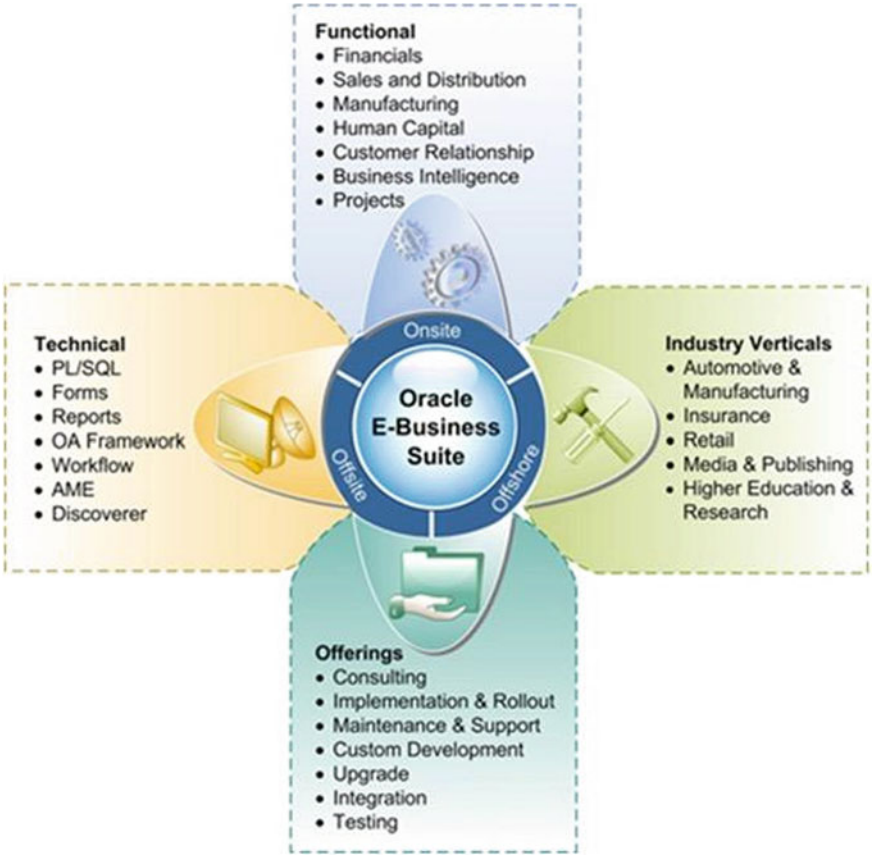

Fig. 2 Oracle E-Business suite

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3.3 Microsoft ERP System

A wide variety of advantageous features for integrations provided by the Microsoft AX ERP system can be seen from the Fig. 3 shared below. The functions of all the departments in the organization are joined and the personalized solutions are provided with interfaces that are user friendly and very advantageous to organizations that have employee amounts ranging from 1000 to 10,000 (Al-Dmour, 2016; Al-Dmour & Teahan, 2005; Al Hamadi et al., 2017; Al Neaimi et al., 2020).

1. Reduced risk of business
2. All ERP problems were joined with a single platform solution
3. Cost-effective
4. Effective decreases the demands of manpower.
5. Cloud backup and memory storage
6. Omitted maintenance
7. Higher production.

Fig. 3 Integration features of Microsoft AX ERP

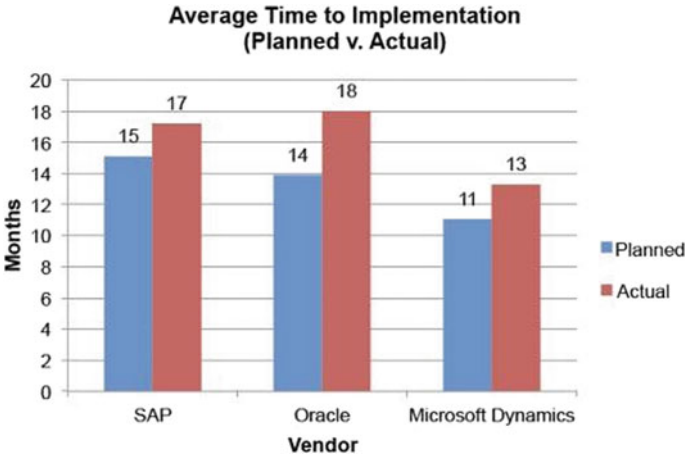

Fig. 4 Average implementation time for SAP, Oracle, and Microsoft Dynamics

4 Microsoft Dynamics Versus Oracle Versus SAP

It can be determined from the Fig. 4 that all three systems of ERP take more time than the estimated time for application. 17 months are taken by SAP; 18 months by Oracle and 13 months by Microsoft. Nevertheless, it shouldn't be forgotten that SAP and oracle in nature are more complicated than Microsoft, and very large organizations that have reach worldwide are catered by it.

Payback Period by Vendor is given another name i.e. Return on Investment of a System (Al-Hamadi et al., 2015, 2021; Ali & Dmour, 2021; Al-Naymat et al., 2021). From the Fig. 5, it can be seen that SAP is the finest choice for the return on investments with profit in the 1st year reaching up to 9%, profits in 2 consecutive years to be 18% and 3 years for the profits to reach 36% which is 4 times the profit of the 1st year. Oracle follows this which gives 5% of the returns in the first year, then 12%, and hen jumps to 17% in the next 2 years but then reduces the expansion so that it covers only 20% returns in 3 or more years.

From Fig. 6, we're given with the representation of the profits between the designers of the ERP systems in industry wise representation. With 22% of market share, SAP is the head profit maker, after it comes Oracle which has a 15% share in profits and third in line is Microsoft at 10%.

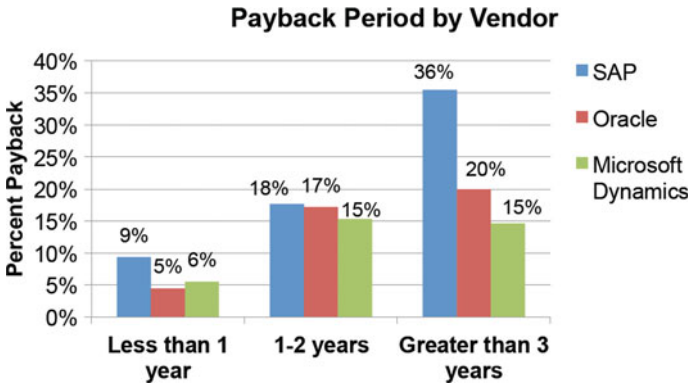

Fig. 5 Payback period by vendor

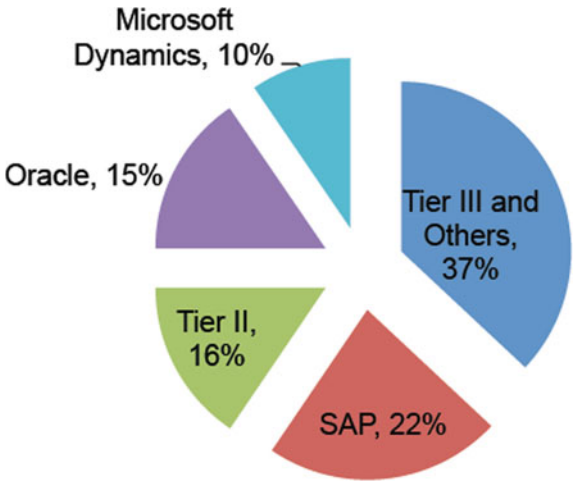

Fig. 6 Profit percentage of major ERP suppliers

5 Conclusions

This paper presented a basic introduction into what an enterprise resource planning system is and defined its key characteristics that make it exactly an ERP. This paper compared Average Implementation Time for SAP, Oracle, and Microsoft Dynamics. It also presented Payback Period by Vendor and Profit Percentage of Major ERP Suppliers.

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How Drones Can Mitigate Unknown-Unknown Risks Case of Covid-19

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Abstract This paper shows the importance of technology in mitigating the spread of Covid-19 which has significantly changed the lives of people, affecting health, livelihood, and the global economy due to the closure of international borders. It has promoted social distancing and increased the need for measures that can eliminate the impact of COVID-19 related issues and outcomes. The research investigates the ways technology can benefit to support teams in preventing Covid-19. It also aims to examine the main advantages of drones during Covid-19. In addition to suggesting the use of drones to fight the Covid-19 pandemic. The inability of some countries to cope with the virus and the effective use of drones to deal with it highlights its importance. However, there is a need to adjust some cultures to the use of drones during the coronavirus crisis. Based on the review of literature, it indicated that people couldn't eliminate the virus impact yet, but they could alleviate the damage they caused. The current research has used interviews to collect data from five organizations involved in the mitigation of unknown-unknown risks, including the Ministry of Health & Community Protection, Dubai Executive Council, DEWA, Melaaha Drones, and ArabDrones. Moreover, a face-to-face interview was conducted by phones and e-mail conversations. As well as a literature review has helped in exploring the unknown-unknown risk method along with the use of Artificial Intelligence such as drones to assist in combating the Covid-19 pandemic. The descriptive qualitative research design has helped to test the hypothesis regarding its ability of drones to mitigate the unknown-unknown risk of Covid-19. The research results part indicated that drones

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_38

are vital constituents of contingency planning. They have proven their value by going for the extra mile in saving costs and lives by incorporating drones technology in minimizing the effects of the crisis which was illustrated with some real examples. Also, the paper has proven the hypothesis by showing another real example on a drone company like ArbaDrone and how they assess, plan and mitigate unknown-unknown risks by following such a specialized program called RIO Project Program to measure and minimize the crisis impacts in the running company. Thus, drones have significantly helped countries such as the UAE to deal with the risks against Covid-19 through the elimination of infection risks with about 96% accuracy via computerized tomography scans. Finally, since the drones have contributed to international success in mitigating the Covid-19 pandemic and having an essential role in fighting the spread of the virus, so, it is very necessary to re-enforce the drone's experience to enhance the fight against coronavirus attracting other tools. Furthermore, extra studies still needed to give more bigger pictures about the impact of this coronavirus statistically to have more information about its influences on the global market.

Keywords Drones · Unknown risks · Risk mitigation · Project risk management · Covid-19

1 Introduction

With technological development around the world, the drones have taken an especial place regarding aerial vehicles technology during the Covid-19. It has gained more recognition. As far as the Covid-19 situation is concerned, it is more about social distancing and avoiding direct contact with the people and effected things around in order to avoid the spread of viral disease (Akour et al., 2021; Alshurideh et al., 2021a, b; Taryam et al., 2020). During the crisis, the drones were an effective medium to avoid all these emergencies where these were used to deliver medical supplies and to monitor the social distancing among the people at public places (Ali et al., 2022; Alshurideh et al., 2022; Hanaysha et al. 2021a, b; Khan, 2021). Along with these drones were helpful in keeping and monitoring the infected places besides, all these drones have a special place in the disinfection programs for sprays.

As UAE has taken keen measures to control COVID-19 spread and this plan is facilitated with the help of drone technology where during the lockdown hours' drones were used to sanitize the city in the sterilization and announcements were made to be delivered around the huge buildings through drones (Spires, 2020). It was easy to track areas and people with the COVID-19 symptoms where drones to manage the procedures, which enhance the speed and efficiency of the tracking areas and managing sterilization operations.

With the help of drones, it was easy to detect the people and separate healthy from sock as these are helpful in measuring the temperature, heartbeat, and breathing rate with their vital intelligence (Farouk, 2021; Mondol, 2021; Obaid, 2021). Socially

these were used for the provision of medical supplies and food during lockdown to follow social distancing rules as well.

During the pandemic situation, the businesses have faced greater losses where drones were helpful in providing them a safe way to approach their customers (Asem Alzoubi, 2021b; Guergov & Radwan, 2021). Technology being the greatest allies in order to fight the pandemic has provided greater ease to continue fighting the battle by keeping the supplies possible to public drones have shown success with versatility (Gascueña, 2020).

2 Literature Review

2.1 Drones

As Earls (2019) mention that drone is unmanned aircraft technology which is formally known as unmanned aerial vehicles technology UAVs or unmanned aircraft systems (UASes). Also, Earls (2019) added that a drone is a flying robot that is remotely controlled. Furthermore, Spires (2020) emphasis that drone's technology proving it's extremely beneficial to reach places that humans cannot reach. This is the reason why it is adopted worldwide particularly, by four sectors: commercial, personal, military and future technology, which leads to the minimum amount of effort and time and energy (AlHamad et al., 2022; Alnuaimi et al., 2021; Alzoubi et al., 2022; Joghee et al., 2020). The use of drones has rapidly changed during the past years, Earls (2019) asserts that drone was used first in the military plus Its contain a technological element and they are: electronic speed controllers, flight controller, GPS module, antenna, cameras, ultrasonic sensors and collision avoidance sensors. In contrast, nowadays drone technology has rapidly developed so the Individuals and governments realized that drones have various uses.

2.2 Unknown–Unknown Risks

All businesses facing risks and everything we do have an attached with the risk. We cannot eliminate risks, but we can mitigate the damage that may cause (Ahmad et al., 2021; Odeh et al., 2021; ONeal, 2018). Besides, As Kim (2012) mention that the classification of the risks is based on the level of knowledge about the impact plus there are four categories and they are: Known–knowns, Unknown–knowns (impact is unknown), Known–unknowns (risks), Unknown–unknowns (risk and impact uncertainty). In addition, BBSCommunications (2019) mention that the business leaders have to make choices that are impacted by factors known and unknown, also the most prevalent risks are unknown-unknown category. Besides, BBSCommunications

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(2019) asserts that the challenge is for looking to minimize risks is to better understand risk. Consequently, BBSCommunications (2019) emphasis to be comfortable with all types of risk it's important to prioritize developing the skills and competencies to be adaptable and responsive to the face of unknown unknowns. On the other hand, ONeal (2018) mention that Unknown unknowns are the most dangerous types of risks plus The danger here is that since the organization is unaware of the risk presence so it cannot manage the risk which results in disaster, to mitigate those risks the organization must look for a solution for every risk and control it.

2.3 How the Drone Technology Can Mitigate Unknown–Unknown Risk of Covid19

Undoubtedly, technology plays a critical role which can mitigate unexpected risks like Covid-19. The question is how the drone technology can mitigate unknown–unknown risk of covid19? It is surprised during the COVID-19 case with the unknown–unknown risk, but building scenarios depend on visibility into the future to mitigate the unknown–unknown risk (Wunker, 2020). In the United Arab Emirates, there were serious action is being taken to keep people safe. According to ONeal (2018), UAE used drones to send across the most public message which is used in the current situation (stay home). On the other hand, the drone is an easy solution to minimize the number of Covid-19 cases. Moreover, drone technology is a part of fighting the spread of Covid-19, according to ONeal (2018) during the lockdown hours, drones were used to sanitize the city in the sterilization program and its start from 8:00 pm tell 6:00 am every day. On the other hand, Staff Report (2020) mention that using drones to manage the procedures which enhance the speed and efficiency of the sterilization operations.

2.4 Use Cases of Drone Technology in Mitigating Unknown Risks

Several attempts have been reported on the use of drones in response to the current global COVID-19 pandemic (Xiao & Torok, 2020). However, drone technology was only occasionally utilized in different situations and not on a scale (Akhtar et al., 2021; Ali Alzoubi, 2021). Based on the analysis and review of research papers and publicly available information on the use of drones in mitigating unknown risks, here are some drone use cases (Martins et al., 2021). According to recent research reports, there are three main use cases of drone technology in mitigating unknown risk, taking the COVID-19 pandemic as a case study. These are (UNICEF, 2020):

1. Transportation: Drone technology has been adopted for transporting (pick-up and/or delivery) medical supplies and lab samples. This does not only minimize

the exposure to infection and unknown risks but also reduces the transportation times.
2. Aerial Spraying: Drone technology has been adopted for aerial spraying of public areas to disinfect potentially contaminated areas.
3. Close Monitoring: Drone technology has been adopted to monitor public areas and ensure guidance during quarantine and lockdown.

2.5 Transportation

According to a recent report, about 18 nations have adopted drone technology for transportation purposes during the COVID-19 pandemic—this includes pick-up and delivery (Al Kurdi et al., 2021; Alhamad et al., 2021). Though some of these countries are still in their testing and experimentation phase, others like Rwanda, Ghana, and Malawi have fully adopted regular drone transportation operations in response to the COVID-19 pandemic, using drones to deliver medical samples, regular medical commodities, and COVID-19 supplies since the outbreak of the pandemic. This has helped the three countries to meet up with the increased demand for medical commodities and COVID-19 supplies (Greenwood, 2021).

While the use of drone technology for transporting samples and supplies during the pandemic period was notable (Sedov et al., 2020), the cost-effectiveness of using drone technology for transportation operations (pick-up and delivery) operations compared to using other established means of transport was not well documented, and has to be considered (Lee et al., 2022a, b). However, the notable and well-documented benefits of drone technology for transportation during the COVID-19 pandemic include reduced risk of infection transmission, limited physical contact, extended transportation network (reaching a wider area), increased speed of delivery of supplies and samples (Kentenyingi, 2021).

2.6 Aerial Spraying

There have been several reports on the use of drone technology for aerial spraying of disinfectants in outdoor spaces and public areas to control and prevent the spread of the Coronavirus. According to reports, using drones for aerial spraying was attempted in China, South Korea, Spain, UAE, and other countries (Ali et al., 2021; Ghazal et al., 2021). In some use cases, drones were able to cover up to about $3km^2$ of an area with spraying. However, there hasn't been substantial scientific evidence suggesting the efficiency and effectiveness of this application.

2.7 Close Monitoring

Several countries across the world including the UK, France, the US, Italy, China, India, Rwanda, Sierra Leone, Spain, and others have deployed drone technology to track non-compliant citizens and monitor public spaces to gain better situational awareness (Kentenyingi, 2021), and if necessary, enforce lockdown by broadcasting messages over a loudspeaker attached to the drone (Alzoubi et al., 2021; Alzoubi & Aziz, 2021). The surveillance, as well as the message broadcasting using drone technology, is expected to reduce the increase in the number of offenders and the possibility of responders having direct contact with potentially infected people (Alsharari, 2021; Eli, 2021; Hamadneh et al., 2021). More so, some academics have recently begun experimenting with drone technology to carry out symptom tracing that is enabled by AI and thermal imagery. According to reports, the use of drone technology for close monitoring is the most widespread use case in response to the COVID-19 pandemic (Khanam et al., 2019). However, some human rights activists have criticized this move and termed it as a potential abuse of civil rights. This led to the suspension of this drone program in some areas (Al Ali, 2021; Hanaysha et al., 2021a, b; Mehmood, 2021).

3 Research Method

3.1 Data Collection Methodology

In order to meet the aims of this project, exploratory and empirical evidence were determined based on **interview questioners** on the data and experience with five particular organizations in mitigating unknown-unknown risks (Al Kurdi, 2016; Alnuaimi et al., 2021). The unknown-unknown risk approach implementation was provided through a contribution by the following organizations:

1. The Ministry of Health & Community Protection
2. DEWA
3. Dubai Executive Council
4. AeabDrones
5. Melaaha Drones.

A face-to-face interview has been conducted for that, along with emails and phone conversations. In support, various papers in journal articles were also explored on unknown-unknown risk and in using Artificial Intelligence like Drones to help combat Covid-19.

The research deployed was a descriptive qualitative design that was adopted to provide answers to the questions associated with a particular research problem in order to obtain information concerning the hypothesis such as *"How the drones can mitigate the unknown-unknown risk of Covid-19"*.

3.2 Data Analysis

This Coronavirus is considered as one of the greatest business management and most challenging we have ever faced, even more bigger than the financial crisis occurred in 2008. For that reason, by evaluating ways how these modern organizations prepared themselves from any un-identified risk (Covid-19 crisis) and its unknown impacts, you can see that their main strategic goal is to understand the risk itself and the probability tails that comes along with it (Alshurideh et al., 2020; Alshurideh et al., 2021; Harahsheh et al., 2021).

But, since the start of the coronavirus outbreak, drones have acquired a new role where it proved it's essential in response to the pandemic, especially in UAE. According to Dr. Ahmed Al Mansoori the Director of International Health Relations Department in the Ministry of Health & Community Protection, the DJI's partnerships with Dubai Municipality, Dubai Police and Sharjah Police have seen the companies of drones were deployed in many applications to mitigate the crisis risk and for battling the spread of the virus by Table 1.

Since the need to reduce the human contact as a health precaution in the time of Covid-19 has provided a boost to the use of drones, According to Mr. Abdel Rahman the founder and the CEO of ArabDrones, many drone companies had got their share from economic repercussions at the beginning, especially the ones used for sports, and shooting commercials & movies, however, the success and failure of a business

Table 1 Types of applications that used drones (UNICEF, 2020)

Medical drones deliveries	
Situational awareness lockdown/curfew enforcement	
Broadcasting useful information	
Spraying streets with water and disinfectant	
Body temperature scanning	

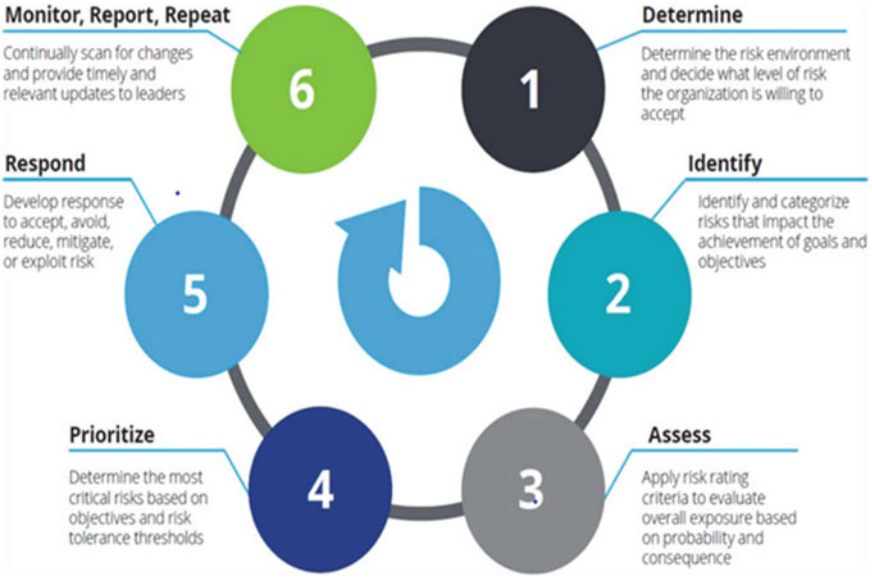

Fig. 1 Risk management process (ONeal, 2018)

depends on risk management to identify, assess and control the threats to an organization's capitals and earnings (Alshurideh, 2022; Alzoubi et al., 2020a, b; Svoboda et al., 2021). For instance, ArabDrones in mitigating their own unknown-unknown risk, they are following the RIO management program guidance for proper decision making (Kashif et al., 2021). The following figure show the process steps which are followed in ArabDrones Company for mitigating risk management approach (Fig. 1).

3.3 SWOT Analysis

SWOT analysis is one of the strategic plans which are used by organizations to exploit their core competencies along with the background and the environmental influences in order to initiate competitive advantage among the business world (Alzoubi & Yanamandra, 2020).

As stated by our interview questioner, the main factors for helping a drone business owner to identify risks based on SWOT related to the business competition are summarized in the Table 2.

Table 2 SWOT analysis

Strength and Opportunities (Positive risks)	Weeknesses and Threats (Negative risks)
– New businesses are being expected due to Covid-19 – Regulations are coming and implemented faster due to Covid-19 – Businesses are leaning into other means of delivery due to Covid-19 – The resources and the networks are supported by the government of UAE – Having many strategic alliances with very important suppliers and clients – Having clear country regulations that can be followed easily – Great low enforcement that can increase drones' company's chances of reducing any legal risk	– Country rules and regulations implications – Lockdown with other businesses due to Covid-19 – Less products supply and resources – Lack of UAE nationals in the industry – Technology is not penetrating all sectors yet – Competitors offering similar products quicker – Competitors with more flexibility in pricing – Lack of commercial knowledge among. Consumers about drone's architectures – The changes in rules and regulations to cut drones operations in UAE skies to be opened sometimes for military usage only

4 Results

Autonomous drones are essential part of the contingency planning for the support of business continuity. The multi mission and on-site autonomous drones have been proven during Covid-19 crisis, the increase efficiency in saving cost and lives by;

1. Covering large areas quicker than the foot patrols.
2. Offering a cheaper alternative to helicopter call-outs.
3. Providing crucial and urgent real time situational awareness aided by thermal and zoom cameras.

Consequently, Dr. Ahmed Al Mansoori noted that drones have been participating with big steps in combating the risk against coronavirus by eliminating the risk of infection with 96% accuracy via computerized tomography scans. In additional to that, according to a recent survey of financial lenders, 42% of respondents in the UAE said that their companies could go back to 'Business as usual' within 3–6 months, thanks to the help from drones and other AI robots over doing what they can do in mitigating the crisis (Alhashmi et al., 2020; AlShamsi et al., 2021; Euronews, 2020; Yousuf et al., 2021). Through Drones IT Technology, a disinfectant study provided essential information to protect those responding to the COVID-19 pandemic, including first responders and health care providers by 96.4% of the cases, as well as provided best practices for individuals to highly reduce the potentials for the contamination on the most effective streets and materials to clean their surfaces to rid them of the virus (Euronews, 2020).

5 Discussion of Results

Key findings

- Results indicate that in addition to others parts which helps the contingency planning which keep continuity of the business as AI, Robots, etc. drones are highly considered as essential and effective method to keep our business and life going on during any crises will happen to our globe (Mehmood et al., 2019). Drones have a speed, short ways, cheap cost transportation, and others benefits generally, which make us depends on it in a large area of usage, which already proved its ability of handling issues regarding to Dr. Ahmed Al Mansoori say. That makes us think more and more to develop extra methods which allow increasing useful capacity of drones.
- The study shows by SWOT analysis the positive and negative risks. Whereas positive risks get the advantage of negative risks, as we can see in the Table 2, almost negative risks are about governmental management issues, which can solve easier than move drones away from the scene (Alzoubi et al., 2020a, b). Others risks are about training and commercial issues, only one risk must be taken in the consideration, which makes the skies open, we can solve it by making the drones traceable with some AI control which declares intension and permissions control (Cruz, 2021; Lee & Ahmed, 2021).
- The Analysis confirm that for the time being, we are in most ever crises we've ever faced, so all organizations must take a steps to improve its ability for dealing with coronavirus, with a new rules and policies in order to mitigate the impact of the crises, as UAE, we have already applied a drones in many fields, as shown in Table 1, but we think it's not enough (Aziz & Aftab, 2021; Miller, 2021; Radwan & Farouk, 2021).
- The data shows that we have to take in the consideration the risk management to identify, and we should mitigate unknown-unknown risk.

6 Conclusion

We've found that UAE is already uses drones in many sides, Medical, Movement control, broadcasting alerts and information, sterilization of public facilities and streets and Body temperature scanning etc. So, the issue we have shown here is related to existing culture, but we need to improve that culture to be useful in coronavirus crises (Abuhashesh et al., 2021; Alzoubi & Ahmed, 2019; Hamadneh & Al Kurdi, 2021). Generally, the basic culture of drones is already existing, we won't need any more training or awareness campaigns.

7 Implications

- Societies will increase using drones in new sectors in future we can see that drones' services are ascending and will get more influence in the markets, that because drones will have the ability to enter areas where human being cant, to mitigate unknown risks such as firefighting, or risks with tangible aspects. Using the drowns will allow authorities to provide the right mitigation of the risks. It might also be a crucial tool for military industry as well.
- Regarding To Dr. Ahmed Al Mansoori declaration which says that drones clear the risk of infection around 96%, which mean 4% out of the total persons who provides the services to infected persons or unknown infected or not persons, the rest of 96% of services providers persons will be decreased out breaking coronavirus, it's good indicator which lead to benefits of drones fighting against the crises.
- But still yet some challenges must be defeated as shown in the Table 2. How much we decrease the challenges how much drones will useful.

8 Limitation

We are still yet not able generalization using drones in a vast side, we need some extra studies with bigger sample size, especially we don't have the time especially what we are in coronavirus crises, any new practical experience will be useful, and we will find many positive outcomes, but still in short term, not for long term.

9 Recommendation

In our opinion, the golden era of the drones has just begun and we think that we are about to see many other companies are going to adopt more effective and efficient ways to use this technology to minimize, monitor and control the impacted risks related to coronavirus. In our recommendations, Drone utilization should be applied to more opportunities across all country sectors to return this huge investment with humanity benefits, as well as technology benefits (Alnazer et al., 2017). We reflect that the need to emphasize drones' capabilities is mandatory to play a stronger role during the pandemic period such as Covid-19 Crisis. Besides that, more studies need to be implemented to introduce detailed tangible results to reflect the impact of drones in mitigating Covid-19 in statistical perspectives. High technology drones' leaders should balance between the short-term preparation while developing new capabilities and new regulations for the long-term. However, customers need to be more educated about this technology and entrepreneurs need to work harder in penetrating drones through social media, Internet information, and advertising into the local market. Moreover, they need to build a strong connection to the community via creative

clubs or earned media generated which will increase awareness from the number of potentially loyal customers. This can help pursuing an outstanding opportunity for drone companies to target other markets such as agriculture, mining, wildlife monitoring, sports coverage, real estate, science, and education.

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The Role of Remote Work in Mitigating Unknown-Unknown Risk During Covid-19

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1 Introduction

From management perspective, understanding the strength of leadership, process, system, operation, and risks is essential to lead the organization to success. Focusing and studying the risks factors impact is important to take the organization to a new level of business excellency and give the management the chance to enhance and improve the performance and efficiency levels of the organization and give the management to understand the position of the organization and what it needs to have a better place among the rivals considering all possible challenges that the organization may have in the future. Which also give the management the opportunity to have other options and plans and be ready to deal with the risks and unknown challenges that any organization may face. The aim of this paper is to know how the risks of the COVID-19 crisis, as an unknown unknown risk, affects the framework of Dubai Ports World, Dubai Economy Department and RTA and how the management at these companies deal with such unknown risk and discuss the outcomes.

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_39

2 Literature Review

Today's business world has changed recently due to COVID-19 and associated risks (Ahmad et al., 2021a, b; Alshurideh et al., 2021a,b; Leo et al., 2021). The pandemic was an unknown uknown risk for companies back in 2019, which made many businesses change their processes fully (Alshurideh et al., 2021a,b; Nuseir et al., 2021). For instance, the pandemic made employers around the world switch to remote working and protect their employees from the virus (Alshurideh et al., 2019a,b,c; Alshurideh et al., 2020a,b; Sultan et al., 2021). Remote working is one of the types of social isolation measures, which has proven effective to reduce the disease spread as employees do not gather in groups and, thus, do not infect one another. At the same time, remote working works differently in each industry (Alshurideh et al., 2019a,b,c; Sweiss et al., 2021). The example of Dubai Ports World company, Dubai Economy and RTA experience sheds light on how effective remote working is in mitigating risk during COVID-19 can be organized (Al Shebli et al., 2021; Alshurideh, 2022; Taryam et al., 2020).

Risks can be categories into three categories: known risks, unknown risks and unknown-unknown risks (Alnazer et al., 2017; Alzoubi & Ahmed, 2019; Mehmood et al., 2019). Unknown risks are defined as "dangers which can be calculated in terms of their probability and impact based on past records" (Kinnvall et al., 2020). Unknown-unknown risks should be differentiated from known risks and mitigated remembering that their consequences cannot be fully foreseen (AlSuwaidi et al., 2021; Alzoubi et al., 2020a, 2020b; Joghee et al., 2020). Inability to deal with unknown unknown risks leads to insecurity. This research will focus on the remote working tool in mitigating the unknown unknown risk at different companies in the UAE.

Risk management is the crucial part of the company's strategy allowing it to remain stable, profitable and efficient (Alshurideh et al., 2020; Alzoubi et al., 2020a, b). Based on the interview results with Eng. Sulaiman AlBloushi Software Department Manager at DP world, Mrs Suhaila Haji General Budget Manager at RTA and Laila AlRamsi, Revenue Section Manager at Dubai Economy, unknown risk mitigation is organized here via the so-called Enterprise Risk Management Framework, implementation of which is carefully monitored by the Audit Committee. Overall, these companies mitigate their unknown risks through continuous market analysis and monitoring of the macroeconomic indicators of the markets of influence, total quality management, big data forecasting analytics.

According to Tysiac (2012), the volume and complexity of risks has increased considerably during the last years and continues growing. Therefore, risk mitigation remains crucial for projects and operational activity (Alzoubi et al., 2021; Hanaysha et al., 2021a, b; Odeh et al., 2021). Based on the literature review in the field, uknown risk mitigation involves proper classification of the risks, crisis management, "reverse stress testing," uncertainty modelling, focusing on both pros and cons of the risk, enabling company-wide responses to emerging threats, and integrating

risk management and strategic management as well as remembering about unpredictable outcomes (Firoozye & Ariff, 2016; Kim, 2012; Segal, 2011; Tysiac, 2012). It is important to continuously reevaluate and back-track perceived loss vs. actual loss from each identified risk because actual loss may be different (Firoozye & Ariff, 2016).

Overall, remote working played a significant role in sustaining work productivity through COVID-19 ensuring that all employees are working safely from home mitigating all potential risks that could possibly occur (Alameeri et al., 2021; Ali et al., 2021; Ghazal et al., 2021). In order to improve it and decrease the chances of unknown uknown risks in the future while working remotely, new strategies need to be applied to avoid low band-width communication, loss job motivation and productivity as well as loss of team collaboration, increased employees' conflicts and inability to resolve some of them remotely (Al Kurdi et al., 2020; Guergov & Radwan, 2021; Khan, 2021; Mondol, 2021). Therefore, companies should implement strategies to avoid possible risks that might occur because of these challenges and problems of remote working through hiring more technological leaders and project managers who can identify how to tackle the most common risks associated to remote teamwork (Al Kurdi et al., 2020; Alzoubi, 2021a; Farouk, 2021; Obaid, 2021; Tariq et al., 2022).

3 Research Methodology and Limitations

The secondary data method is used in this paper. Data that is related to risk management at Dubai Ports World, Dubai Economy and RTA was searched in order to find the main methods that these insitutions use in order to avoid any unexpected losses or risks that threatens the company's framework.

4 Findings

The key findings of Dubai Ports World, Dubai Economy and RTA remote working had significant relationship between the positive and negative outcomes, there was an noticeable increase in the productivity level of employees and had the highest rates of engagement due to the flexibility and since there was less distractions and the majority found that it's easier to concentrate at home, another positive impact was reducing employee turnover, since it was indicated that offering remote working is a valuable retention tool for all organizations (Alhamad et al., 2021; Alnuaimi et al., 2021; Hanaysha et al., 2021a, b). On the other hand, the negative outcomes had unknown unknown risks, since some companies have a good enough cyber-security system in place, while some are not aware of the risks involved in connecting remotely (Al Ali, 2021; Alzoubi, 2021b; Salloum et al., 2020). Thus, Home Wi-Fi Security as opposed to the office's internet connection, where IT support can control the security of all the Wi-Fi networks system, employee's home networks may probably have weaker

protocols than office's internet connection which allows hackers to easily access the network's system (Akhtar et al., 2021; Al Kurdi et al. 2021; Eli, 2021; Kashif et al., 2021). The current COVID-19 pandemic led to a transformation in remote work which inevitably brings a new set of risks and challenges (Rubinstein, 2020). Since working from home became mandatory in the previous period, organizations must rapidly ensure the security of every laptop, it was found that the best practice to protect departments from unknown uknown risks mitigation is carrying out virtual training for employees to educate them on how to protect their IT system from hackers and the potential risks they should know about (Alsharari, 2021; Alshraideh et al., 2017; Mehmood, 2021; Miller, 2021).

Regarding DP world, RTA and Dubai Economy cases, it seems that they maintain an effective system of internal control which is embedded in the main key operations that is designed to provide reasonable assurance of the organization's strategic business objectives and to mitigate unknown unknown risks (Ahmad et al., 2021a, b ; Al-Dmour et al., 2021; Aziz & Aftab, 2021; Cruz, 2021; Radwan & Farouk, 2021; Ben-Abdallah et al., 2022). In addition, the key components of the internal controls are listed below:

1. Risk Assessment: identification and the analysis of risks that prevent from achieving their objectives, by identifying the risks in a proper manner the management will be able to easily determine how to mitigate and manage the risks effectively. Risk factors may consist of internal/external factors, which shall be evaluate risk on a regular basis, like changes in the company from new policies, staffing and software application that can all impact on the risk assessment of the company (Hamadneh et al., 2021; Lee & Ahmed, 2021).
2. Control activities: consisting of the procedures and guide of policies that help ensure that directives are implemented. One of the main points of control activities is segregation of duties, by having different individuals responsible for authorizing the organization transactions, performing reconciliations and having custody of assets (Alshurideh et al., 2022; Alzoubi & Aziz, 2021).
3. Information and communication: relating identification of pertinent information in a timely manner that permits personnel to perform responsibilities (Ali et al., 2022; Alzoubi et al., 2022). Like for example, having the finances report in a timely manner allow management to identify the differences in its operations in terms of high reserves and drops in margin.
4. Monitoring: the key element to internal control when it to comes to the management, since it's their responsibility to monitor all the controls and determine if they're operating as they were intended. If the operation of the controls is not effective, it's then the management responsibility to amend the internal control (AlHamad et al., 2022; Lee et al., 2022a, b).

It was found that if all these components of internal control are implemented and are operating effectively, they can ensure that the company is mitigating unknown uknown risks while achieving their organizational objectives, please see Table 1.

Table 1 SWOT analysis

Strengths: – Solid Ground for the system – Strong Management Policies & Procedures – Widespread Awareness Program	**Weaknesses**: – Strong Risk Management System which obstructs the internal work and progress – High level of security affecting performance
Opportunities: – World leading in trade innovation, global presence and entering new markets	**Threats**: – Out of control with continuance changing in laws and regulation

5 Recommendations and Conclusion

After understanding and analyzing the Dubai Ports World, Dubai Economy and RTA' management perspectives, the reserachers noticed some areas that might need few adjustment or enhancement that would give the company a push to a better position at the market in difficult times, such as the recent pandemic, and how to deal with the challenges and consequences of the crisis that they might suffer from in the future taking remote work as an option or solution as the following:

- Remote working is a new thing for many employees as theys haven't seen such situation before in which they have to work from their homes, they have a habit of going to offices but due to the current cercumstanses it is mandatory to do the usual tasks online. It semms that employers face difficulties in this, so the company should give their employees a complete online training in which they will be guided and explained how actually remote working requirements are and how it should be currectly done in order to make it more effective rather than wasting time doing tasks that add no value to the required objectives, and how to overcome the possible technical issues that they may face while using such technologies. The management also should run a technical tests on the systems and platforms the employees are using as well as examining the employees after the training is done to check whether they have learned about their remote working and if they have any confusion related to remote working it can be cleared out with them.
- Communication gap is a key of many problems, if there is no proper communication between the employees and company then the company will face huge loss. It is necessary for the management to develop such a system in which the communication gap can be reduced to minimum, employees should be in daily contact with the system so the management is aware of what is happening and can predict the risk factors and make suitable arrangements to solve them otherwise simple communication would not be effective. The company should conduct live sessions for their employees. It is suggested to conduct effective Microsoft teams training sessions through a webinar on MS teams; to extend the knowledge and demonstrate the key advanced features, which will help in improving the overall communication and collaboration between the employees.

- It is essential for the management to monitor their system at regular intervals especially in such situation where they are not able to deal with employees face to face. If a management keeps a check on the system after several months and witness any issue, then it will be too late to solve it. Reports should be generated and compared with previous ones to see the improvements in the company. If the previous reports are better than the new one then the management should immediately call a meeting of all the employees on MS teams and find where the actual problem is. So, through this daily communication and check the chances of loss for the company through remote working will be minimized.
- Hacking is the main issue of remote working; hackers can steal information and miss use them which attackes the company's confedintial database and create many serious problems the company. The management team should tackle this issue by installing security system in the devices of their employees on which they work. The system indicates any threat in the work and the employ can immediately tackle with it to avoid any data breaching. The companies should also hire an IT experts who should keep checking on the overall system so in case if the data is hacked then the expert can immediately recognize the problem and prevent the system from the data breaching and inform the management so they will be aware of such threats and work to find a solution to avoid it.

Due to the situation of Covid-19, remote working is basic need instead of shutting down the production line at such situations. It is an ulternative solution to keep the business running. It has its own pros and cons; therefore, the management team should find and create methods to make it as much as effective and effeciant as possible.

To conclude, the main issue regarding remote working is the increase of unknown uknown risks. The research was conducted in this regard with reference to different companies in the UAE and it was found that they have implemented many strategies regarding this situation which are very effective that helped to grow but these are only effective when the management keeps proper check on all implementations rather than making the policies and then not taking any action on them. Measures such as a complete training of employees, providing a complete security system to them so the data could not leak and ensuring that security is provided to all employees, along with daily communication and monitoring of all the activities can improve the operations to a greater limit.

Appendix

Questionnaire for interview

1. Organization name, interviewee name, date of interview
2. Brief about the organization
3. Brief about risk in the organization
4. Any experiences in unknown risks? Risks which taught you lessons

5. Do you have a risk strategy in your organization?
6. Do you have a risk methodology in your organization?
7. How do deal with unknown risks?
8. Do you have a strategy and/or methodology for unknown risks identification?
9. Can you tell us about this strategy and/or methodology?
10. Do you use any of these technology tools?

No	Tools	
1	Artificial intelligence	
2	Blockchain	
3	Telehealth technologies	
4	Three-dimensional printing	
5	Nanotechnology	
6	Drones	
7	Robots	
8	Remote Work	
9	Distance Learning	
10	Supply Chain 4.0	

11. Are you using any other tools?
12. If (Yes) please specify

No	Tool	Planning Risk management	Risk Identification	Qualitative analysis	Quantitative analysis	Planning risk responses	Implement Risk responses	Monitor risks
1	Artificial intelligence							
2	Blockchain							
3	Telehealth technologies							
4	Three-dimensional printing							
5	Nanotechnology							
6	Drones							
7	Robots							
8	Remote Work							
9	Distance Learning							
10	Supply Chain 4.0							

13. If (yes) Give us a brief about the tool
14. In which risk process do you use these technology tools
15. Based on Q14, In which risk process do these technologies mitigate unknown risk (Tick ✓ all applied)

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No	Tool	Planning Risk management	Risk Identification	Qualitative analysis	Quantitative analysis	Planning risk responses	Implement Risk responses	Monitor risks
1	Artificial intelligence							
2	Blockchain							
3	Telehealth technologies							
4	Three-dimensional printing							
5	Nanotechnology							
6	Drones							
7	Robots							
8	Remote Work							
9	Distance Learning							
10	Supply Chain 4.0							

16. Based on Q15, Identify the tools and/or processes that mitigate unknown risks. What, how, what results, his personal judgement, how to improve it.
17. Any other tools or processes that lead to unknown risk mitigation?
18. What are the strengths and weaknesses in the organization based on the interviewee opinion?
19. What are the opportunities and threats in the organization based on the interviewee opinion?
20. Final recommendations or any additions the interviewee likes to add.

Instructor Feedback for the research components:

	Excellent	V. Good (h)	V. Good (L)	Remarks
1. Abstract			✓	
2. Introduction			✓	
3. Literature review			✓	
4. Hypothesis			✓	
5. Research method			✓	
6. Data gathering			✓	
7. questionnaire			✓	
8. Analysis			✓	
9. Limitations			✓	
10. Recommendations			✓	
11. Conclusion			✓	
12. Depth			✓	
13. Logic and flow			✓	
14. Others			✓	
15. Overall work			B	

More Details: Work is done to a Good level to meet the minimum requirements. Work can be improved in almost all aspects especially literature review and data gathering to analysis and conclusions.

Work structure and the flow and logic is good.

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Impact of Remote Work on Project Risks Management: Focus on Unknown Risks

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Abstract Unidentified risks, also called unknown unknowns, have been outside the scope of organization risk management for a long time. Many leaders believe uncertainties are difficult to find or imagine in advance. For instance, when COVID-19 spread quickly to different parts of the world in early 2020, the sudden shift of tens of millions of workers from on-site to remote work locations was experienced across the globe. Many businesses sent their staff to work at home, and most enterprises adopted technology to maintain their operations. Remote work has been aided by new technological platforms, including virtual private networks (VPNs), voice over Internet protocols (VoIPs), virtual meetings, and other collaboration tools. During this COVID-19 pandemic, these technologies have reduced the spread of the virus, enabled employers to decrease overhead expenses, helped workers to gain flexibility, and abridged overall organization risks. This study gathers critical information about remote work amidst unknown risks, such as COVID-19 pandemic, by relying on qualitative and quantitative data. The study develops a model to characterize unidentified risks by gathering employees' perspectives on remote working. Data collected will be compared in terms of the benefits and challenges of remote work. The findings and discussion will be used to suggest and recommend ways organizations can rely on remote work to improve performance and mitigate sudden, unknown risks.

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_40

Keywords Remote work · Unknown risks · Risk mitigation · Covid-19 · Project risk management

1 Introduction

With many risks yet unknown, organizations' ability to conduct business as usual will constantly be tested. Finding many unimaginable risks have been beyond the scope of project risk management in various institutions. The outbreak of coronavirus disease in 2019 revealed that employees can significantly experience disruptions in their work environments. As soon as the COVID-19 pandemic was announced by the World Health Organization and many countries outlined containment measures, organizations turned to technologies to help meet employees' needs and manage workloads remotely. Many people turned to remote work environments to a scale never experienced before. For example, as of mid-February, nearly 4.7 million employees in the United States worked remotely (PWC, 2021). When we mention remote work, various software and solution are included "such as video conference tools "Zoom, Cisco Webex, and Google Meet", enterprise collaboration tools such as Microsoft Teams, Slack, and Workplace from Facebook, and ephemeral messaging applications such as Snapchat, WhatsApp, Telegram, and Signal". Containment measures, such as social distancing, increased these numbers from 33% in February to 61% in March (PWC, 2021). The change of work environment also demanded a transformation of skillsets and attitudes for both organizations and workers. Remote working through technologies, such as VPNs, VoIPs, or cloud technology, requires certain skills to adopt (Xio & Fan, 2020). With unknown unknowns, organizations struggle to balance between security and flexibility for remote work employees. As a result, the role of technologies in mitigating unidentified risks has emerged as one of the critical concerns for organizational leaders. Many employees have embraced remote work because it provides flexibility and eliminates commute time. However, there have also been negative impacts of such arrangements on productivity, creativity, information security and privacy, loneliness, and lack of work-life balance (Xio & Fan, 2020). To learn comprehensively about the impact of technology-aided remote work on the productivity of employees during unidentified uncertainties, studies have turned to remote work benefits, challenges, and best practices (Ali et al., 2021). Therefore, remote work, with the help of technologies, can mitigate unknown risks if they can help organizations to visualize the real-time state of the workforce to make informed decisions, assess and bridge security gaps in a remote environment, and secure distributed work models for the long-term.

2 Literature Review

Unknown unknown risks are considered to be very rare in the IT industry but once they have been found either intentionally or non-intentionally, they could be mitigated because they might harm the system of the organization (Hamadneh et al., 2021). From the perspective of risk management, the unknown risks are not acceptable. The individual has the advantage that from the known risks they could easily make multiple solutions.

Considering the example of known risks, the current situation of the world, millions of workers are staying home due to COVID-19 (Wressell et al., 2018; Aljumah et al., 2021a, b; Alshurideh et al., 2019a, b, 2021; Harahsheh et al., 2021). Somehow, some of the industries allow their workers to work from home due to the fact that those organizations want to continue their operations. Therefore, it could be easily said that COVID-19 has built the remote working infrastructure for multiple businesses (Ahmad et al., 2021; Alameeri et al. 2021a, b; Leo et al., 2021; Nuseir et al., 2021a, b). The remote working is an attractive benefit for the employees as it provides ease for the workers to work remotely (Al Kurdi et al., 2020; Alameeri et al., 2021a, b; Kurdi et al., 2020). But at the same time, it presents some of the security challenges which are hard to break (AlShehhi et al., 2020; Alsuwaidi et al., 2021; Hanaysha et al., 2021a, b). It also facilitates a decentralized team in which the security will be top of the mind which is concerned with the IT department which does not increase with the VPN capacities, beefing up the safety protocols which ensure remote teams follow practices.

2.1 Strategic Plan to Mitigate Risks Associated with Risks

As per the study conducted by Rapp et al. (2020), there is a strategic plan in order to mitigate the unknown risks from working remotely that organizations should follow to increase their productivity insecure environment (Alnuaimi et al., 2021). The strategic plan for mitigating the risk is to provide access for employees to access various software applications that would manage and facilitate them to work remotely (Alshraideh et al., 2017; Alshurideh, 2022; Ben-Abdallah et al., 2022). It includes accommodation to employees to enhance the remote VPN workers. From the study conducted by Wressell et al. (2018), it has been witnessed that globally, the use of corporate VPNs is increasing. OpenVPN licenses could be purchased at the price of each connected device (Alhamad et al., 2021). However, as Ben Popper of Stack Overflow pointed out, for many organizations, their VPN infrastructure is not built to manage all internal organizations, so the need to speed up may be a challenge. It requires infrastructure and at the same time, SC Magazine recommends working hours to distribute with existing VPN functions.

In this same consideration, the study by Rapp et al. (2020) also recommends the organizations that they should ensure to keep the devices patched and up to

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date. Considering this strategic method, a study by Yeboah-Ofori and Opoku-Akyea (2019), addresses that the National Cyber Security Center's government guidelines on remote services urge IT, workers, to ensure that employees understand the importance of keeping software (and their equipment) up-to-date and should know how to perform the best from this equipment which ultimately enhance the level of productivity (Joghee et al., 2020). Besides, the other strategic option is to boost security awareness with mandatory training. According to the study conducted by Wressell et al. (2018), 45% of employers have not received safety training from their employers. Consumer safety training can help them understand how to prevent phishing attacks and other frauds. The same study found when organizations invest in cybersecurity training; they can reduce security threats by 70%. A short training will encourage employees to be vigilant and avoid risky behaviors, such as clicking unfamiliar links and accidentally deleting infected documents. The other way to mitigate the risks is the encouragement of the digital basic hygiene (Hanaysha et al., 2021a, b). This simply means that the individual is using a fast-paced security system to reduce online threats to the individual and its business.

The other strategic method to reduce the remote risks is to become pro-active in risk management. In this manner, the study conducted by Yeboah-Ofori and Opoku-Akyea (2019), states that it is important for the individual to follow and apply Murphy's Law and think that anything that might go wrong will be damaged. This may not be the time to invest or implement a comprehensive risk management system, but it is still important to formulate policies and strategies to minimize risks (Alnazer et al., 2017). According to Rapp et al. (2020), although each organization has its strategy, an important part of this process is clear and consistent in this activity so that it can cover all employees, outsiders, or others. In addition to this, the other strategic option to mitigate the security risks is the usage of the cloud software solutions which is concerned with the file management (Ghazal et al., 2021).

2.2 Methods to Mitigating Risks

2.2.1 Cloud-Based Environment

The unknown risk in this consideration is also the cloud-based environment risk which highlights that the remote workers often need technology solutions that rely heavily on the cloud. The use of the cloud can save the cost of implementing customized projects for key users; however, cloud computing carries its own set of network security threats (Ali et al., 2022). In such a way, it has third party control issue which is initiated due to the usage of multiple applications via adding a vector for the cyber security risk practices which sometimes become out of control. This means that the third party will initiate the intentionally hardware issue and breached it malware which could be potentially vulnerable to control (Yeboah-Ofori & Opoku-Akyea, 2019). In cloud-based environment the users also face other issues such as increased the potential for the risk breaches, this occurs when the information is

presented by the third party (Alshurideh et al., 2020). In addition to this, the third issue faced by the remote workers is the account hijacking and insider threats which brought multiple hindrances in the work which is related to the cyber security.

2.2.2 Cloud Access Security Brokers (CASBs) and Protection Tools

CASBs such as MVISION Cloud, Bitglass and Microsoft Cloud App Security are tools or services that work as part of the gateway infrastructure of third-party cloud providers, thereby achieving security and early management. The study conducted by Firoozye and Ariff (2016), addresses that the individuals should use a third-party cloud. All CASBs provide network and firewall, test equipment, and data loss prevention functions to prevent the transmission of sensitive data outside authorized channels (Mehmood et al., 2019). The Cloud Access Security Foundation (CASB) is the state or entry point of a cloud security strategy that is set between the cloud service provider and the cloud provider to integrate the two (Alshurideh et al., 2022). Enter the security policy strategy as security. Get resources from the cloud. CASB brings together various security policy frameworks. Examples of additional security include authentication, group identification, authorization, credentials, device profiles, encryption, tokenization, registration, input, and detection/prevention (Radwan & Farouk, 2021). CASB ensures that the network traffic between the local device and the cloud provider complies with the organization's security policy. According to Zhang et al. (2018), the user's advantage in protecting cloud access comes from its ability to provide information about the use of cloud applications and unauthorized use on the cloud platform. This is very important in the management industry.

As per Firoozye and Ariff (2016), CASB performs automatic detection to detect cloud applications, and then uses them to identify high-risk, high-risk users and other high-risk sources. Cloud recipients can apply administrative access rights to various securities, including encryption and authentication (Aziz & Aftab, 2021). When they are not logged in, they can also provide other services, such as certificate mapping. In addition to knowledge-based security, there must be a safe security tool system to prevent data leakage caused by human errors: firewalls, VPNs, security software, and all anti-malware software that plays a role in protecting security.

3 Research Methods

To understand more on how we can create a resilient society after the effects of the unknown risk, we decide to conduct a research on one of the current technological trends which is remote working and how did it mitigate and manage risks aspects. As this tool became a norm in today's world, a world that has been hugely altered by the pandemic. A pandemic that created an atmosphere of fear and unpredictable because

the world has not expectation or knowledge of what's to coming. Using COVID-19, as an example it has been ranked for both known and unknown- unknown risk, known risk because organizations are aware of it and how dangerous it can be on a person's health since it spreads easily and there is no known cure for it yet (Lee et al., 2022a, b). It is an unknown risk because organizations do not know the extent of it and are unaware of the size and effects that this risk will have on their organization's performance and future.

The aim of our research was to get a better understanding of what remote working has done to organizations, has it helped the organizations to grow in facing risks or helped them to stabilize or did it led to their failure? Is remote working the way to go post-COVID-19? To gain this understanding, we looked at both qualitative and quantitative data. The benefits of qualitative research are that it provides an insight of the social reality that the subject is living in at a certain point of time. As Denzin and Lincoln (1994) have stated that qualitative research is a multi-method in focus, attempting to make sense of, or interpret, phenomena in terms of the meanings people bring to them. The benefit of incorporating quantitative research is that it provides statistical data which can be compared and analyzed, thus presenting straightforward findings (Cruz, 2021). Combing both qualitative and quantitative research helps improving the reliability of the data because both of these data balance out any data limitations. In our research for the qualitative research we have conduct interviews, one interview per member group, so 5 interviews in total to these specific companies:

National Search and Rescue Center: organization cooperate with federal authorities in all aid and emergency processes.

Emirates Central Cooling Systems Corporation (EMPOWER): largest district cooling Service Provider in the Middle East.

Emirates Airlines: one of the biggest most efficient Airlines organizations in the world.

Zayed University: Educational channel.

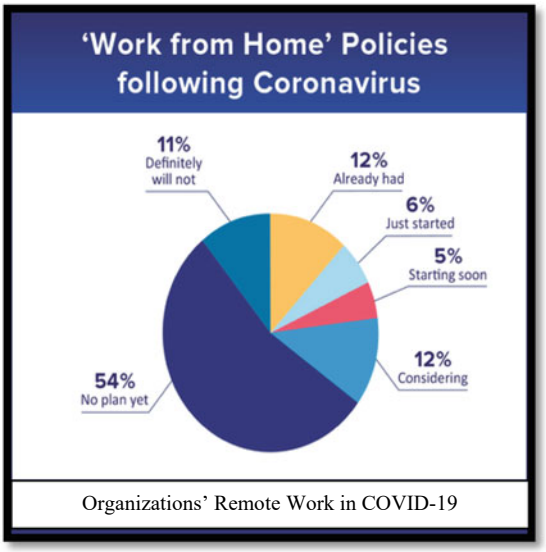
Emergency Crisis and disaster Operational Center: organization mitigate unknown risk as one of their daily core tasks.

Interviews are a great method to use to understand the situation better and explore the interviewee's, the research subject, opinion, experience and behavior around the research topic which remote working as for the quantitative research we have looked at secondary data because it is time effective since we has limited time for the research (Lee et al., 2022a, b). Another benefit of using secondary data is that has allowed us to evaluate and analyze a high volume of data in a short amount of time, to create a more rounded understanding on how remote working has led to the mitigation of unknown risk in our pandemic reality.

The interview questions that we used were the same questions that the professor has shared. It had a total of 20 questions, divided in to 3 sections which are general and background information about the employee and organization they work in, the second section is the main body questions that revolve around risk produced and risk methodology of the organization in questions. The third section is all about the strengths and weakness of the organization (AlHamad et al., 2022). The third section is different than the other sessions, in that it has 3 open-ended questions, this type

of question allows the interviewee's to include more information and express their opinions and feelings more openly (Lee & Ahmed, 2021). The secondary data we used were surveys that were conducted both locally and internationally has a response and evolution on how remote working has helped in reducing the unknown risk. The analysis method that we used to analyze the interviews was looking at the language that was used by the interview (Shamout et al., 2022). Also look for patterns and themes within the 5 interviews. The analysis of the secondary data was based on comparing the tables and chart with each other and interprets them into words to link them to our primary data.

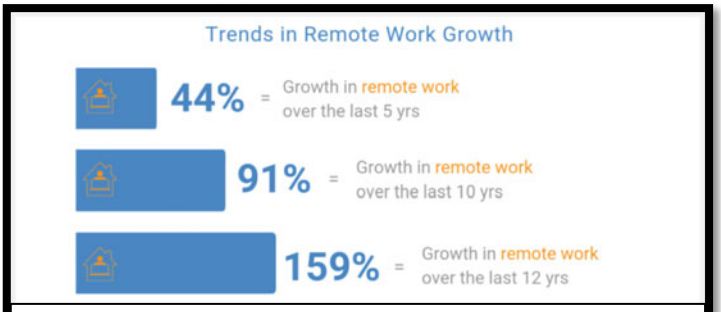
4 Analysis of Results



4.1 Quantitative Method Analysis

Several critical questions were asked such as *does Remote Work mitigate any kind of risk including knowns and unknowns and is that measurable*? *Does it really mitigate unknown risk?* As we noticed, related to the last period, organizations dramatically expand adapting remote work in their strategy. However, the statistic showed how business in the GCC and internationally moved to use remote working in various

risk cases from the secondary resources we collected, where these resources gathered statistic evidence how companies shift their system to remote work directly and succeed mitigate the pandemic risk (Al Ali, 2021). The most known case that organization measures their unknown risk mitigation system nowadays is "COVID-19" because it has been the current case situation labeled as unknown risk; accordingly, the world is still suffering from, Thus after COVID-19 announcement in the world a study was done to indicate remote work implementation in organizations. As the above chart clarify that 35% of the organizations are raising remote work in their business plan process (Alzoubi et al., 2022). Therefore, these GCC business organizations are processing the accommodation of remote working, where a big percentage didn't plan since the beginning to enhance this method, which made them weakened their business cycle process and face several issues, which is one of the reason that affected economic growth nowadays "Many emerging and developing economies were already experiencing weaker growth before this crisis; the shock of COVID-19 now makes the challenges these economies face even harder" (The Global Economic Outlook During the COVID-19 Pandemic: A Changed World, 2020). Many organizations adapted and bought systems to build new IT infrastructure to operate a valued usage of remote work for the sake of controlling their business activities under the unexpected unknown risks (Kashif et al., 2021). Especially after the announcement by ministry of Human Resources and Emiratization Resolution No. 281 of 2020 regarding policies and protocols of remote working seeking minimizing and limiting the spread of COVID-19 "COVID-19 Middle East: Employment update on new government initiatives, 2020". A survey conducted by GulfTalent to 1,600 employees from different positions in the GCC showed that One-third of GCC organizations arranged work from home to counter Coronavirus danger. Looking more closely on how different gulf countries reacted to remote working, where Bahrain formed the top rate of remote work strategies by 38%, followed by UAE, Kuwait, and Qatar with 37% respectively. Remote working got high rates in different aspects; numbers and growth were increasing year by year (Akhtar et al., 2021). Hence, we will represent some numbers and studies globally that evidence the advantages of Remote working as modern technology used years ago.



Trends in Remote Work Growth chart (Braccio, 2020)

The chart clarify how the trend of remote work is expanding year by year as people got more knowledge wise of its significance benefits and gains that is originating to both party organizations and employees (Alzoubi & Aziz, 2021). Depending on the result obtained in this chart, a huge increased rate of remote work growth has been noted; the growth rate over the last 12 years has increased dramatically to reach a 159% which means that people are looking forward and having a great business continuity plan included in their entities strategy. Moreover *Is it measurable,* productivity is a good measurement to judge on specific technology and here comes "FlexJobs' annual survey which found that 65% of respondents are more productive in their home office than at a traditional workplace" (Braccio, 2020), which is a big rate that can assure employee productivity off-site, which lead us to determine that employees have the ability, equipment, knowledge and skills to perform outside the office under different risks and circumstances.

4.2 Qualitative Method Analysis

The interviews we conducted has clarified that most organizations in the UAE tend to use remote work today to mitigate the pandemic risk. Few of them stopped in the UAE after the announcement of allowing employee perusing work in their office, were others added remote work in their new strategies to react for any unknown and known risk that can occur suddenly in the future. Organizations' Business Continuous Plans updated the remote work as a must method to mitigate coming risks (Alzoubi et al., 2021). As Ayesha Al-Hashemi mentioned in her interview Empower as UAE organization, had the plan to prepare new physical place in case any thing happened to the main work office. Where what happened actually was moving in the path of adapting remote work suddenly because it is more efficient and effective in facing the unknown risk that organization faced. Mr. Murugesan Vasanthan the director in Empower mentioned that business plan should be updated yearly and restructures more details aspects, which seem to be a strength that affects business process on adapting efficient initiatives such as remote work (Eli, 2021). That statement support experts' recommendations mentioned in the literature review in updating strategies methods and devices to enhance better risk plan mitigation. Furthermore, Dr. Amina Ali Abdulla the Risk Management and Business Continuity Project Manager from MOH recommended in her interview to adapt the implementation of remote work forever because of its usefulness (Alsharari, 2021). As she stated in her interview that today we can realize that remote work technology would proceed to what's behind COVID-19, where the GulfTalent, 2020 supported that by stating that "75% of current teleworkers say they plan to work remotely for the rest of their career" "GulfTalent, 2020". Besides, Maryam AlMarar from Zayed University stated that in this period everyone recognized how remote work had the value and the power to stand against unexpected threat arising anytime (Mehmood, 2021). So far we could value remote work and empower it to mitigate risks; yet, its importance was not stressed clear enough before facing previous unknown risks (Al Alzoubi et al., 2020a, b; Awadhi

et al., 2021; Al.Khayyal et al., 2021). Emirates Airline merged the use of remote work and artificial intelligence in their process as they supported that by stating "we ensure to use latest IT infrastructure and secure technology to exchange the viable information securely without any breach or delay" (Miller, 2021). One of the most disappointing things we knew was that the National Search and Rescue Center; one of the most important organization are not using remote work benefits and advantages. Especially that they deal with unknown risk in a daily base.

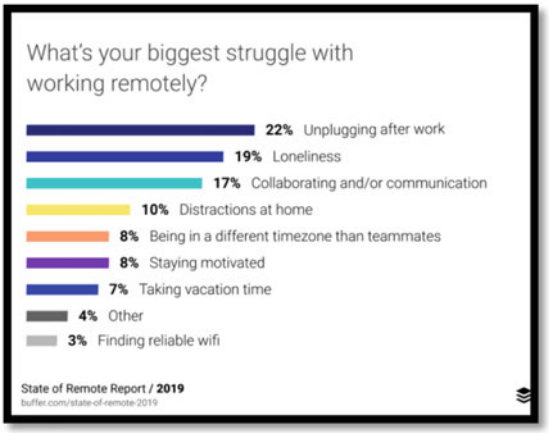
Remote work seems to be a must today, not a method that may be implemented one day, because obviously that day came and everyone had to expose their planning effort and preparedness (Al Kurdi et al., 2021; Alshurideh et al. 2019a, b; Khan, 2021). Today, it isn't only about flexibility and employee satisfaction only by making them work from home which remote work can offer; it is more of keeping the business cycle going by applying one of the greatest effective methods that mitigates unknown risk (Agha et al., 2021; Al Batayneh et al., 2021; Al Shebli et al., 2021; AlMehrzi et al., 2020; Alyammahi et al., 2020; Nuseir et al., 2021a, b).

4.3 Challenges

Challenges that occurred to new remote work implemented strategy could be avoided in case of trainings presence to employees occurred. Maryam AlMarar mentioned the difficulties rose in adapting new systems, where they were not familiar with, which could be avoided if proper training courses were given to employees (Mondol, 2021). It is surprising how big developed entities were eliminating remote work from their plan; especially that it is not a new aspect that was introduced few years ago. E-government services were developed in our current region to support the idea of performing and producing through using technologies and internet. Wressell et al. (2018) stated that employees lack of safety protocols and cybersecurity knowledge increase threats of frauds and scams (Alzoubi & Ahmed, 2019). Challenges and difficulties rise with any new initiative; remote work has its own as well. There is no doubt of major problems that this tool can derive with, but in the same time organizations can't avoid enhancing advantages and values this method that can arise because of their fair of future coming problems. Somehow, remote work can be one of the best solutions to the coming future unknown risks.

A study was done in Doist, an organization that works fully remotely where it creates Applications. This study was indicted to clarify challenges alongside remote work. Communication, unplugging and loneliness were the major issues that face employees in their production by 58%, which is big number (Guergov & Radwan, 2021). Amir Salihefendic, the organization CEO mentioned that these are issues to be considers where it effects on employee performance and motivation toward producing, where people do not take into consideration the less seen side that result in really complex issue "State of Remote Work 2019, 2020".

Literature review as well, mentioned challenges such as cyber and security matters that can affect organizations and their privacy (Farouk, 2021). The loss in communication is a serious issue that can raise other misunderstanding in sharing information, delivering news and knowledge limitations (Obaid, 2021).



5 Discussion

Experts expected that remote work will be taken more seriously even after COVID-19 crises. As business owners, CEOs, managers and employees went through it, got the needed training and adapted new working lifestyle that can be used anytime and every time (Alzoubi et al., 2020a, b). Thus, the importance and advantages this technology derives tend to become a major way of mitigating unknown risk. Introducing a change and training employee to accept it may be difficult and takes time, while the case was different this time, employees and organizations had to collaborate in making remote working a success tool to overcome this unknown risk.

Organizations that adapted Remote Work way age, had the ability to develop, fix and prepare their technology for any coming risks. However, others who just listed Remote Work in the "In Process to Implement One day" faced the bigger issue. I believed that we were step behind mitigating unknown risk when we had the Remote Work strategy to be considered and most of the organizations did not take it seriously. Studies were done years ago to highlight importance of this strategy in proceeding work and how it derives many benefits any organization can achieve. However, the fear of failure is the most common issue that builds organization limitations in adapting a new technology, where it is not that new actually going back to Remote Work establishment. As we go over the literature review, we can view ways, solutions and issues that this tool generates. As employees who worked remotely just with the

COVID-19 presence, were experienced a modern working system and succeed in. Being able to reach work from home increase our ability to perform and flexibility to exchange information. Pros and Cons of remote work vary in different aspects and as per experience technologies has both good and bad sides. The resistance of adapting new way showed in the beginning merging the fair of the unknown risk that we experienced, but with starting and being inspired by government statements we had the opportuning to produce in a positive culture which added the productivity instead of the stopped business process.

One of the major reasons behind the slow reaction initiatives by organizations is the poor knowledge about pro-active risk management applications that this method can provide. Besides, the weak readiness on updating systems, software and training courses that organization should of change and revise on a yearly phase (Alzoubi & Yanamandra, 2020). With the remote control occurrence in organization, some structure where updated or developed new system that ease the information sharing system. Previous functions highlighted the importance of sharing data or keeping updates of important records. However remote control created an easier more e-functional system that simplify procedures and apply data retention plans that report faster ephemeral messaging platforms.

6 Matrix SWOT Analysis

	Strengths Support from the management Regular updates and check ins between the manager and employees Improve flexibility of employees work schedule Higher autonomy	**Weakness** Capacity Employees have low technological skills Over time the power of the employees will decrease with the increase stress of IT issues Lack of social contact Lack of research and preparation on remote working
Opportunities Improve risk management strategy New research and training course Improve work-life balance	**Strengths-Opportunities** Introduction of a new business model strategy that combines both remote working and onsite working (S1, S4, O1) New and increase method of communication to maintain a health work-life balance at home (S2, O3)	**Weakness-Opportunities** Invest more in training that focus on improve employee's IT skills and how to trouble shoot (W2, W3, O2) Regular check-ins with employee to check on their health, workload and get feedback. (W3) New researches and preparation of implementing remote work in the organization (W5, O2)

(continued)

(continued)

Threats	Strengths-Threats	Weakness-threats
Shortage of IT specialist Lack of shared introduction throughout the organization Unsecure network, thus increase phishing attacks	Hire more IT specialist that have experience with Risk management (S1, T1) Improve systems for the future (T3)	Low IT skills that might result in attacking organization's systems (W1, W2, T3)

7 Recommendations

Based on the literature review analysis and interviews conducted previously, we would recommend the governmental and private organizations the followings to improve role of remote work in risk mitigation.

7.1 Implement Remote Working

The organization should have a clear strategic plan in remote work and implement it precisely based on their criteria. Organizations can set specific procedures and techniques for implementing Remote Working to ensure the efficiency and productivity. There should be a clear strategy that adapts the Remote Working requirements to suit the nature of work and the job categories with emphasizing on the importance of committing to their duties and responsibilities. In addition, the organization should ensure that most of its services are available to its employees and customers through online communications, smart applications, etc. Moreover, learning from other entities or organization around the world about their experience with remote work in such circumstances will enhance the organization's dynamic work as well.

7.2 Remote Work and Business Continuity Planning

The pandemic of the COVID-19 was an imbalance of opportunities. Some organizations across the world had shut; other had failed in production whereas the rest did not even feel the change and the productivity were still at its same level. COVID-19 which is considered as unknown risk was the reason the organizations had to notify the importance of updating their business continuity plan. Essentially, the most effective elements of BCPs are the teleworking or working from home that the organizations were lacking them in their BCP's and strategic plans. Few organizations had the BCP's but were lacking their annual updating which resulted in not being able to enhance the productivity during the remote working (Alzoubi, 2021a).

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Therefore, we would recommend all the organizations to follow the strategy that is followed by the Emergency Crisis and Disaster Operational Center (MOH) in which they are used to revise their BCP's annually even if nothing happened and update them when necessary with adding the new tools added around the world such as artificial intelligence, robots and other tools. By applying this strategy, the organizations will ensure the lower risks and harms possible in case of crises or risks appearance and will be able to maintain the organization's functions or resume them quickly. Whether the COVID-19 pandemic lasts for weeks, months or years, the organizations method of communicating with their capitals will be critically important for their continues success. In fact, the organizations that are more flexible and responsive to the modern BCP's will fare better in our current environment.

7.3 Strategic Initiatives

Based on the literature Review, other recommendations are preferred and prioritized to be implemented in every organization after the appearance of COVID-19 pandemic for their preparedness of any future unknown risks. The Strategic plan to mitigate risks associated with risks is to implement plans that would allow the employees to access the required software applications that would manage working remotely. This strategy includes the adaptation of employees to enhance the remote VPN workers. Another strategic plan is to become pro-active in risk management. Within this strategy it is important for the organization to follow and implement Murphy's Law to think in advance in case something might go wrong. Although each organization has its strategy, an important part of this process is clear and consistent in this activity so that it can cover all employees, outsiders, or others.

7.4 Cloud Programs

According on the literature Review mentioned above, other recommendations such as Cloud-Based Environment and Cloud Access Security Brokers (CASBs) and protection tools are chosen to implement. The Cloud-Based Environment saves the cost of implementing customized projects for the employees although we know that cloud computing carries its own set of network security threats such as having third party control issue which starts as a result of using multiple applications by adding cybersecurity risk practices which is sometimes out of control. Whilst the Cloud Access Security Brokers (CASBs) and protection tools such as Microsoft cloud are tools and services that work as part of the infrastructure of third-party cloud providers, they achieve security and early management to the organizations in order not to face any hackings (Alzoubi, 2021b). CASB brings together several security policy frameworks, such as authentication, group identification and authorization.

NSRC consider that one whole research should be done to the National Search and Rescue Center with strong recommendations and suggestion to implement remote work method.

8 Conclusion

To conclude with, individuals can work remotely in many ways. That is the magnificence of inaccessible work; individuals can select to work in a way that creates the foremost sense for their lives. Remote work is solving nowadays a big work issue due to the pandemic caused by covid-19 virus. In the future, we believe that most of the entities, government and companies around the world will have a separate remote work strategy to ensure the business continuity plans of any organization. This paper discussed remote work that mitigate unknown risk, provided strong literature review, implemented qualitative and quantitative research method, analyzed results of both methods and discussed them with providing recommendations and suggestions.

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The Impediments of the Application E-Business to Classified the Restaurants in the Aqaba Special Economic Zone

Omar Jawabreh, Ra'ed Masa'deh, Tamara Yassen, and Muhammad Alshurideh

Abstract The study aims research paper seeks to study the status of tourism promotion in Jordan, in particular via the Internet, with a future plan to develop this type of promotion based on the needs of the country of this research paper is to draw conclusions that help to know and understand this type of tourism promotion, And to know how to develop it in Aqaba Special Economic Zone Disseminatethe maximum information about the restaurant in the Aqaba, this research paper is designed to determine the conditions of websites used in tourism promotion of the restaurants to find out the obstacles that face this type of promotion via websites, and the factors that affect its the promotion is to be a primary tool for economic development in tourism destinations, The objectives are to increase the contribution of the tourism sector to the obstacles of e-business in the classification of restaurants and to benefit economically from the tourism industry through employment opportunities and investment, product Development and tourism experience, promotion of tourism in restaurants, between the public and private sector in Aqaba.

Keywords Financial problems · Technical problems · Security problems · Management problems · Legal problems

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_41

1 Introduction

With the growth of tourism, the industry has become the world's biggest (Goeldner et al., 2000; Masa'deh et al., 2018; Yannopoulos & Rotenberg, 1999). A Social, Cultural, and Economic Phenomenon: Tourism is described by the World Tourism Organization as an activity involving individuals going to nations or locations outside of their normal surroundings for personal or commercial purposes. Consequently, tourism focuses on visitor behavior, which necessitates a deep understanding of how technology and consumer behavior impact travel-related data dissemination and accessibility. Understanding the content of information that may be available to internet visitors is a key step in developing successful tourist marketing campaigns, better information systems (Al Khasawneh et al., 2021; Fesenmaier et al., 2006; Jawabreh, 2017; Jawabreh & Al Sarayreh, 2017; Masadeh et al., 2019; Xiang et al., 2008); and acquiring superior innovations (Alrowwad et al., 2020; Mahmoud et al., 2021; Obeidat et al., 2019; Qandah et al., 2020). Though it seems that social media is on the rise in the online travel information search industry, there is no scientific data to support or explain this trend.

Websites that utilize a search engine to find appropriate travel information may expose tourists to social media content to a greater extent. When each seller focuses on nurturing and increasing their various channels of information and persuasion, this is referred to as promotion, the marketing of a place is intertwined with cultural aspects. (Herbig, 1998) says customers' needs vary between cultures. One conclusion can be drawn: all destination images and marketing materials produced by the local tourism industry should include a level of authentic destination identity (Go et al., 2004; Noordman, 2004; Onians, 1998; Rekom & Go, 2003; Riel, 1996). This tourism development strategy consists of two stages: creating a tourism "product," and commercializing the offering using that identity and the authenticity of the place (whether staged or real). Then, a projected tourism destination image is created through planned marketing and communication, or through vicarious experiences (Cohen-Hattab & Kerber, 2004). Destination image formation agents (Gartner, 1993), and Internet interactivity may allow these destination photos to be presented in novel ways. If a destination's brand identity and tourist product presentation don't match, there may be a tourism development strategy mismatch. Jordan's tourism promotion, namely the Internet, was studied by Alananzeh et al. (2019); Jahmani et al., 2020; Jawabreh et al., 2020), with the hope of extending this approach in the future to suit the needs of the tourism sector.

This study is intended to uncover facts that will help us to better understand this type of tourism marketing and to assist the Hashemite Kingdom of Jordan in their tourism promotion (Jawabreh, 2021). This coastal city has an excellent temperature all year. During the summer, it is hot and invigorating, while in the winter it is warm and comfortable. The city is designed to meet the requirements and wants of the whole population, including both summer and winter. There are many things to choose from while in Aqaba, including watersports, sailing, diving, and a variety

of other exciting desert-based activities, including camelback riding and exploring Petra. Aqaba is a desert oasis where these activities occur.

Because of the location's unique aquatic environment, which includes 140 different kinds of coral reefs and colorful and unusual fish species found only in the seas of Aqaba, the ocean scenery in Aqaba is a breathtaking spectacle. Aqaba has archaeological sites that date back at least 5,500 years, which provide evidence of the early human presence in the area. By placing Aqaba in this context, it highlights the importance of Aqaba's role in the military. Land and sea connections link Asia, Africa, and Europe through this city. This newly discovered structure, which is widely believed to be the world's oldest church, comes from the Mamluk period, and it is the grandfather of His Majesty King Abdullah II. Aqaba is a unique place where the red of the sky combines with the blue of the sea to create a vivid, underwater scene. It is also a wonderful destination for conferences, holidays, and business retreats, especially Aqaba. If you are here for pleasure or business, you'll find enough to do, see, and enjoy, as the absence of monotony and boredom are also guaranteed. When in Aqaba, it leaves you with many wonderful memories and urges you to return. This place is a veritable Mecca for people from all over the world. It is a city in the desert. Think about how much you'll enjoy spending time in this beautiful oasis, and plan a vacation to Aqaba where you can relax in the sun (ASEZA, Aqaba Special Economic Zone Authority).

2 Literature Review

Managers and business owners in the hotel and tourism sectors spend the majority of their time concentrating on changing each of these components to provide a competitive offer to customers (Kotler, 2003). The researchers in this study examined the challenges faced by the online commerce sector while using the idea of the internet. Pillars of Content Performance, developed by the Arab country (and available on N.D.), laid forth a framework for identifying factors that affect website success. The main actors in website success are quality of information and service, system use, interactivity, and design. To achieve success, an e-commerce website should contain these criteria: a user-friendly online interface, superior customer and supplier assistance, a robust search engine to fuel the website, ensuring that the site's customers are satisfied, and providing up-to-date information. The articles in this review demonstrate that technology is utilized in the design, planning, production, and development of manufacturing. Also referred to as electronic commerce and the economic and financial consequences of such activity, this phrase relates to the term "electronic commerce" (Hoffman & Novak, 1996).

The goal of this study is to investigate Aqaba's unique economic zone, the progress made in online commerce, and the difficulties restaurants have with websites. Specifically, 36 restaurants were surveyed using questionnaires. These surveys discovered that the majority of these restaurants' websites were not used for electronic commerce. Internet business is difficult in Aqaba because of security, trust, and a

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lack of understanding about technical problems. This study looked at the speed of information and communication development, which allowed for the wide-ranging transmission of information. The current report said that it saw new discoveries in this area as a key component of economic development and online commerce. It included topics such as e-tourism and mobile tourism, as well as the issues that arise when tourists claim that there is competition among them. as well as how electronic services such as e-books, photos, videos, e-booking, and e-cards can serve tourists in Arab countries. Despite the efforts of the tourism industry, nothing has been written on the monetary worth of shopping as a tourist attraction (Heung & Qu, 1998; Law & Norman, 2000). Because tourism retailing research is just starting, it seems that we have a clear need to find out what tourists buy when they visit tourist attractions. The rise in domestic tourism observed in recent years may be attributed to Jordan.

Due to the increasing wealth of the Jordanian people and the growing interest of tourist organizations in promoting domestic tourism to assist in reducing the Kingdom's seasonal demand for tourism, this was a primary factor behind the rise in domestic tourism (Magablih, 2005). According to this theory, in order to increase the amount of tourist activity, "push" and "pull" motivations must be used (Josiam et al., 1999; Kim & Lee, 2000). Push motivations are the external societal and psychological forces that push a person to travel. The web also provides greater possibilities for regional tourist promotion than traditional marketing and advertising channels, and it is very cheap (Standing & Vasudavan, 2000).

Another significant aspect is the information included on tourist websites, and one study shows that this is what travelers are searching for (Ho & Liu, 2005). The chance of return visits is increased (Rosen & Purinton, 2004). For these reasons, when tourism businesses have shifted from simply giving information to interactive designs, they may uncover consumers' interests and help encourage their return. Personalizing service offerings empowers these businesses to better understand customer needs, which allows them to engage with customers on a personal level and to provide tailored services (Doolin et al., 2002). As a consequence, the information found on government tourism websites affects the destination's gastronomic image. It also offers a realistic tasting experience for food-oriented visitors, and the design of a website influences how people react (Rosen & Purinton, 2004).

The reorganization of municipal administrations in response to the change brought on by globalization and economic restructuring may be linked to the concept of place promotion. The future of post-industrial towns depends on attracting inward investment and migration, and in order to do so, places have been conceptualized in new ways. The achievement gap exists even among minority children who attend majority-minority schools. While according to Ashworth and Voogd (1994), the promotion of a particular bundle of facilities or the selling of a place as a whole may be referred to as marketing, promotion in the context of this research refers to targeting key employees to advance the sales team's objectives. Placement of an advertisement is a facet of location marketing, which is concerned with linking "local activities" to the wants of targeted. A wide range of techniques, not just advertising campaigns, are used to promote places, depending on the product, its surroundings, customers, and manufacturers. The purpose of place promotion is to create an appealing identity

which will entice target groups such as investors and tourists (Palmer & McCole, 2000; Young & Lever, 1997). Increasingly, the Internet (with the most current web technology) offers a wide range of information in an incredibly rapid manner, necessitating it as a tourism-sector marketing and promotion tool (particularly for hotels and travel companies, e.g., DMOs and national tourist organization NTOs) (Abuhashesh et al., 2019; Brey et al., 2007; Choi et al., 2007; Kim et al., 2007).

The web also provides greater possibilities for regional tourist promotion than traditional marketing and advertising channels, and it is very cheap (Standing & Vasudavan, 2000). Because your website is accessible 24 h a day, 7 days a week, from anywhere on the globe, it may reach a global audience. Website material is essential, and it must be kept up to date (Lin & Huang, 2006). In order to find out why tourists frequent shopping malls, the purpose of this study was to investigate why tourists buy. To what extent are Jordanians motivated to purchase property in Aqaba? It may be concluded, based on the quantity of shopping malls in the location, that what attracts visitors is having the freedom to select among various shopping malls.

The rise in domestic tourism observed in recent years may be attributed to Jordan. Due to the increasing wealth of the Jordanian people and the growing interest of tourist organizations in promoting domestic tourism to assist in reducing the Kingdom's seasonal demand for tourism, this was a primary factor behind the rise in domestic tourism (Magablih, 2005). The goal of this research is to offer advice to business managers who wish to do a better job of marketing to meet the needs of their consumers.

3 Research Methodology

This section provides the methodology applied in the current study. It consists of the research operational definitions of the study's variables, besides data collection tool and research population and sample.

3.1 Research Operational Definitions

The current research considers five variables regarding (Jawabreh et al., 2010). These includes Financial problems, Technical problems, Security problems, Management problems, and Legal problems; which were measured in the research questionnaire through seven, seven, seven, six, and seven items respectively.

3.2 Population and Sampling

The targeted population of this study consisted of all staff that is responsible of disability services in Aqaba city hotels located in Jordan, specifically hotels 5, 4 and 3 stars. Thus, a judgment sampling technique was conducted. A total of 142 questionnaires were returned and applicable for statistical analysis. Indeed, the primary data was collected through a drop-and-collect survey technique. The surveys were distributed to the targeted staff working in the hotels that agreed to participate in the study.

The questionnaire consisted of two sections; the first section in questionnaire presents general personal information about a respondent, the gender, age, educational level, career level and ranking of the hotel. The second section includes questions to measure the ENAT standards based on their operational definitions.

4 Data Analysis and Results

In order to explore the degree to which Aqaba city hotels apply ENAT standards towards disabled tourists, in which the items for these variables have been measured using 5-points Liker scale that varies between strongly disagree = 1; 2 = disagree; 3 = neutral; 4 = agree and strongly agree = 5; reliability and validity analyses were conducted, descriptive analysis was used to describe the characteristic of sample and the respondents to the questionnaire's items.

4.1 Validity and Reliability

Validity and reliability are two important measures to determine the quality and usefulness of the primary data. Validity is about accuracy and whether the instrument measures what it is intended to measure while reliability is about precision; it is used to check the consistency and stability of the questionnaire. Indeed, the researchers depended on scales and items that were previously developed and used by Jawabreh et al. (2010).

Also, a draft of the questionnaire was formulated, and then it was reviewed by three academic lecturers–who have a sufficient knowledge and experience in this scope-to ensure that each item is measuring what is intended to be measured, and to avoid the ambiguity and complexity in the phrasing of questions. The reliability of the instrument was measured by the Cronbach's alpha coefficient. Further, some scholars (e.g., (Bagozzi & Yi, 1988; Creswell, 2009)) suggested that the values of all indicators or dimensional scales should be above the recommended value of 0.60. Table 1 represents the results of Cranach's alpha for the research variables. Cronbach's alpha

Table 1 The Cronbach's alpha coefficients of study variables

Variables	Number of items	Cronbach alpha
Financial problems	7	0.715
Technical problems	7	0.722
Security problems	7	0.730
Management problems	6	0.786
Legal problems	7	0.883

coefficients of all the tested variables are above 0.60 which suggesting the composite measure is reliable.

4.2 Respondents Demographic Profile

As indicated in Table 2, the demographic profile of the respondents for this study showed that they are typically females work in private sector, most of them between 20 and 40 years old, the majorities hold bachelor degrees; and most of them got a monthly income 350JD and more.

4.3 Descriptive Analysis

In order to describe the responses and thus the attitude of the respondents toward each question they were asked in the survey, the mean and the standard deviation were estimated. While the mean shows the central tendency of the data, the standard deviation measures the dispersion which offers an index of the spread or variability in the data (Pallant, 2005; Sekaran & Bougie, 2013). In other words, a small standard deviation for a set of values reveals that these values are clustered closely about the mean or located close to it; a large standard deviation indicates the opposite. The level of each item was determined by the following formula: (highest point in Likert scale - lowest point in Liker scale) / the number of the levels used = (3–1) / 5 = 0.66, where 1–1.66 reflected by "low", 1.67–2.33 reflected by "moderate", and 2.34–3 reflected by "high". Then the items were being ordered based on their means. Tables 3 and 4 show the results.

As presented in Table 3, data analysis results have shown that all problems in Aqaba hotels are applied to a high level in which the range of the mean score is 2.34–2.45. Table 4 demonstrates the mean, standard deviation, level, and order scores for items for each variable/standard.

Table 2 Description of the respondents' demographic profiles

Category	Category	Frequency	Percentage (%)
Gender	Males	38	38.4
	Females	61	61.6
	Total	99	100
Age	Less than 20	20	20.2
	20 years—less than 30	41	41.4
	30 years—less than 40	22	22.2
	40 years—less than 50	8	8.1
	50 years—less than 60	3	3.0
	More than 60 years old	5	5.1
	Total	99	100
Monthly income	Less than 250JD	15	15.2
	250—less than 350 JD	25	25.3
	350—less than 450 JD	31	31.3
	More than 450 JD	28	28.3
	Total	99	100
Occupation	Private sector	53	53.5
	Public sector	46	46.5
	Total	99	100
Educational level	High school	24	24.2
	Bachelor	54	54.5
	Masters	13	13.1
	PhD	8	8.1
	Total	99	100

Table 3 Overall mean and standard deviation of the study's variables

Type of variable	Mean	Std. Dev	Level	Order
Financial problems	2.4026	0.64419	High	3
Technical problems	2.4556	0.69395	High	1
Security problems	2.3997	0.75039	High	4
Management problems	2.4394	0.85165	High	2
Legal problems	2.3478	0.67073	High	5

5 Discussion and Conclusions

When confronted with the findings of the research, hypotheses and questions are answered. Thirty-six restaurants that provide websites and utilize them for Internet trading performed the research and found that of those, less than one-third have not

Table 4 Mean and standard deviation of the study's variables

Financial problems	**Mean**	**SD**	**Level**	**Order**
High prices of computer equipment and networking tools and software	2.04	1.339	Moderate	6
High wages charged by information professionals	2.34	1.451	High	5
The high financial cost of establishing and managing an electronic trading site	2.35	1.487	High	4
Banks are not cooperating in online transactions	2.54	1.431	High	1
There is no financial intermediary to guarantee payment in electronic payments	2.53	1.417	High	2
Our customers do not use electronic payment cards in their dealings	2.49	1.501	High	3
The transition to electronic commerce will not entail additional financial income	2.53	1.561	High	2
Technical problems	**Mean**	**SD**	**Level**	**Order**
Our organization lacks the equipment to link and share information (networks, servers)	2.38	1.426	High	6
Our database system is not configured to connect with the Internet	2.43	1.458	High	3
We do not have people who are specialized in computer programming	2.72	1.519	High	1
The difficulty of following up and maintaining the website of electronic commerce	2.42	1.512	High	4
Lack of specialized companies interested in the establishment and management of sites for electronic rent	2.41	1.471	High	5
Lack of proliferation of computers connected to the Internet when our clients	2.29	1.443	Moderate	7
Rapid and ongoing developments in hardware and software	2.53	1.548	High	2
Security problems	**Mean**	**SD**	**Level**	**Order**
Dealing with electronic payment system is not safe and offered to steal stocks	2.29	1.394	Moderate	7
Linking enterprise systems with the Internet presents them for information piracy	2.38	1.448	High	3
Electronic transactions in the Internet are not free of fraud and forgery	2.46	1.560	High	2
There are many cases of fraud and fraud in electronic transactions	2.63	1.588	High	1
The difficulty of protecting the data transmitted on the Internet from manipulation and switching	2.37	1.454	High	4
Connecting to the Internet increases the likelihood of a computer system being compromised	2.35	1.380	High	5

(continued)

Table 4 (continued)

The fear of the control of service providers and the telecommunications sector and its reflection on the work	2.30	1.432	Moderate	6
Management problems	**Mean**	**SD**	**Level**	**Order**
We do not have knowledge of how to launch online trading services	2.48	1.466	High	3
We have no plans to change the course of our business at this time	2.52	1.548	High	2
Our organization does not need to increase the number of its customers at the moment	2.41	1.471	High	4
Difficulty dealing with the status of cancellation of the service request after payment for electronic transactions	2.27	1.470	Moderate	6
There are no successful e-selection experiments at similar institutions	2.62	1.595	High	1
There is no government encouragement for enterprises to move towards e-commerce	2.33	1.392	Moderate	5
Legal problems	**Mean**	**SD**	**Level**	**Order**
The request for the service requires the physical presence of the customer first	2.86	1.597	High	1
Requesting the service electronically by different types is not binding on us	2.38	1.489	High	2
The verification document must be verified for the customer who benefits from the service	2.23	1.427	Moderate	6
Lack of information available about the legal aspects of electronic commerce	2.35	1.487	High	4
Electronic contracts pose a challenge in their legal catharsis	2.27	1.470	Moderate	5
Weak legislative tax policy in the trading environment	2.39	1.406	High	3
Lack of legal legislation regulating electronic commerce	1.94	1.284	Moderate	7

been used for online trading, but problems arose in implementing the Internet trade securely and confidently in Aqaba. This mostly resulted from the increase in the net worth of Jordanians and an increased focus on domestic tourism as a means of reducing seasonality in the Kingdom (Magablih, 2005).

Tourists have different requirements, desires, and preferences. Therefore, in order to succeed, marketing strategists must understand and fulfill their needs and preferences while competing (Magablih, 2005). The idea of tourist motivation is outlined in a well-documented theoretical framework, which is known as the "increase motivation through inspiring via drawing inspiration" (Josiam et al., 1999; Kim & Lee, 2000). When considering travel motives, you must also look at the socio-psychological requirements that drive a person to go on a trip. This opportunity to help rural tourism thrive will be unique, and much less costly compared to other marketing and advertising methods (Standing & Vasudavan, 2000). Global audiences may be reached by using an excellent website: it is available around the clock from

anywhere on the globe. Website content is critical, and must be updated frequently in the tourist marketing industry.

The primary subject of this study was the Aqaba special economic zone and how e-commerce impacts the economy in the area. A smart question about electronic commerce and restaurants in the Aqaba special economic zone: What effect has electronic commerce had, and what complications have businesses in the Aqaba special economic zone faced when utilizing the internet to market their products? E-commerce websites, on the whole, are not typically utilized. With online commerce, the Aqaba has the most trust, security, and understanding of technical problems as obstacles. In this study, the rise in information access was shown to be mostly due to the massive expansion in the quantity of information in the information and communication industry.

The research also addressed the reality of e-tourism in Arab nations and what the e-services may offer visitors, such as e-books, pictures, video, e-booking and e-cards. It is now very impossible to get much information about shopping as a tourist attraction (Alshurideh et al., 2021; Heung & Qu, 1998; Law & Norman, 2000). Research on tourism retailing is a new area of study, and there seems to be a need for researching tourists' buying habits while visiting tourist destinations. The number of domestic tourists in Jordan has grown in the past few years. When it comes to meeting the varied wants, interests, and tastes of tourists, marketing experts must be very knowledgeable about the industry and able to offer goods and services in a cost-effective manner (Jawabreh, 2017).

Push and pull provide a well-established theoretical framework for assessing tourist motivation excitement (Josiam et al., 1999; Kim & Lee, 2000). Indeed, (Josiam et al., 1999; Kim & Lee, 2000) argued that for the most part, travel motives are motivated by social and psychological motivations. Additionally, it also serves as a useful tool for marketing the area's tourism. Coupled with more modern means of advertising, including the internet, it is less expensive than conventional media like television and radio (Standing & Vasudavan, 2000). To be successful, a website must target the whole world's population, and it may be done from any place at any time of day. Website content is essential, and it should be updated regularly in the industry (Lin & Huang, 2006).

Of the many resources on the internet, one of the best sources of travel information is websites like this (Ho & Liu, 2005). Once again, invite individuals back to the website and over (Rosen & Purinton, 2004). To enhance tourist returns, there are two possible routes. One way to provide information is through interactive design, while the other is to use interactive design to offer information. Additionally, these businesses are in a better position to understand their visitors' preferences, which allows them to provide personalized services to individuals rather than generic packages (Doolin et al., 2002). Gastronomic image and virtual culinary experience are both greatly affected by the content of government tourist websites. People's interests and preferences change (Rosen & Purinton, 2004).

Promotion is said to be connected to local government shifting to meet the changing nature of the economy because of globalization. New place identities that have been created to promote investment and in-migration are important tools in

attracting inward investment and migration to local post-industrial areas (Law & Norman, 2000). In regards to location promotion, the idea of promoting a certain bundle of amenities was explored by Ashworth and Voogd (1994), and their research indicates that location promotion is the process of marketing a location as a whole by using pictures containing numerous different characteristics linked to it. Placement of promotional forms is inadequate when used alone. The requirements of targeted consumers should be taken into consideration while considering local activities. A question by Ashworth and Voogd (1994) is left open: Advertising is not the only strategy that places and goods use to get attention. Some of them include the context of the product, the intended audience, and the creator. Creating an appealing identity that draws a particular set of investors and tourists is key in a location marketing strategy (Young & Lever, 1997). This is typically done by deconstructing pictures of the location and then rebuilding them, as described by Jawabreh (2020). Electronic commerce has revolutionized the tourism sector by providing a case study (Palmer & McCole, 2000). New online technology makes the Internet a potent marketing and promotion tool for tourism.

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Adoption Factors of Digitize Facilities: A Management Review

Alaa Ahmad and Muhammad Turkih Alshurideh

Abstract This research study specified the Building Information Model has structures such as formation and sharing of the data with other associates of the project. Building Information model was used as a tool for the improvement of sustainability of constructions by consuming the energy effectively and upholding a waste organisation process in the post constructed level in the business highlighting the facility management. The objective of this systematic review is to provide the digitalization technology to have a better understanding which accomplishes the development of electrical devices, approaches and organisations that make the statement more precise and flexible by focusing on previous studies. Surveyed the strategies of showing the systematic review for which the investigators have focused on two main records which are google scholar and emerald insights from which the case studies were selected by clarifying the scholars based on year (2018–2020) and concentrating on eligibility standards. The three studies that were certain of which 2 were from google scholar and one was from emerald insights. These were choose based on sustaining the aims of the present study. The outcomes of the current study revolve the significance of combination between technological digitalization, capabilities, business, and organisation of digital Facility Management. To conclude, the digital practices of the sustainable facility management are experiencing appraisal and transformation.

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_42

1 Introduction

With the increasing digitalization of operations, facilities digital transformation creates challenges, the most crucial challenge present organizations adaptation (Tilson et al., 2010; Yoo et al., 2012). As a result, organizations must constantly monitor and assess the capabilities and risk posed by evolving digital technology (Bharadwaj et al., 2013). Scholars and practitioners alike have acknowledged the value of digital technology in organizations. This comprehension of how new digital technology practices affect businesses in remarkable ways has an influence on internal operations and how they interact with their external environment. Scholars and practitioners alike have acknowledged the value of digital technology in organizations. This comprehension of how new digital technology practices affect businesses in remarkable ways has an influence on internal operations and how they interact with their external environment (Carbonari et al., 2015). There is an added incentive for customers and facility managers since they stand to gain the most financially from the digitization of facility management services and use (IoT) (Eadie et al., 2013). More precisely, the research seeks to provide the groundwork that will lead to understand factors that influence facilities managers acceptance of digitalization facility management operations and utilize (IoT) projects.

2 Digitization of Facilities Management

The evolution of building technology has altered the way FM functions. Building technologies are rapidly being used in buildings (Wong et al., 2005). Many analogue, electrical, and mechanical equipment are gradually being converted to digital technologies, which has had a significant influence on industry (Alaloul et al., 2020). To comprehend digitization significance, In our study, we must look at the term digitization, Chapco-Wade (2018) defines *digitization* as "the conversion of analogue to digital" and *digitization* as "the use of digital technology" and digitized data to affect how work gets done, revolutionize how organisations connect and interact, and generate new digital income streams. The shift will be unlike anything civilization has ever seen in terms of its scale, range, and complexity (Fomunyam, 2019). This is causing significant disruption in the facilities management (FM) sector where "technology is an enabler of the workplace" and "smarter buildings are just around the corner" (Atta & Talamo, 2020; Cudmore, 2017; Kazado et al., 2019). Building technologies are rapidly being used in buildings, the rise of intelligent users' where knowledge is gathered in integrating building technology with building operations to provide an optimal building environment. As a result, there is a need to modify the way buildings are managed (Lee et al., 2001; Wong et al., 2018). Many researchers and facility managers have recommended leveraging data from building technologies to help with building and operations administration (Kensek, 2015).

3 Methodology

The study focused on providing all existing evidence digitalization on FM adoption and acceptability from the perspectives of facilities managers via a systematic review from the perspectives of various stakeholder. A literature review is defined as a "complete examination and interpretation of literature on a certain topic" (Grant & Booth, 2009). Given the study's objectives and questions in the first phase, a systematic review was conducted: first, to present robust evidence of the status of digitalization in FM service adoption and acceptance with specific and focused questions such as (Population, Intervention (or focus of Interest), Context, and Outcome); second, to identify the knowledge gap in the literature; and finally, to inform the study's subsequent phases. We intend to Using an explicit method, such as a systematic review, has proven to bring some significant benefits (Gopalakrishnan & Ganeshkumar, 2013), such as: reducing bias, producing accurate and reliable conclusions, making information easier to deliver to healthcare providers, researchers, and policymakers, developing new hypotheses about subgroups of study populations, and, most importantly, increasing the performance and quality of the results (Greenhalgh & Donald, 2000). Google Scholar, ScienceDirect, and Scopus were the three electronic databases included. These sites were chosen because of their reputation for covering a wide range of digitization and technology articles from scientific and academic journals. The search was limited to research done in English because this has been demonstrated to be the predominant language for digital facilities management literature. The following search terms were applied: ["Digitize Facilities management" OR "Digitize FM"] AND ["Facilities manager" OR "Facilities professionals"] AND [adoption OR acceptance]. The PRISMA checklist for reporting scope search results was used, as illustrated in (Fig. 1). Furthermore, an alert was set up in all databases to notify us of any freshly published articles that met the search parameters.

4 Data Extraction Table

This data extraction table is shown by aiming on the study style, whether it contains state, members, objective, limitations, results, along with the methodology of each study (see Outcomes section) (Table 1).

5 Discussion

The existing section will deliver the literature knowledge gap by aiming on studies that will support and have a contradictor effect on the studies that have been involved. This will help the researchers in focusing on other facility Management which is a productive device to find the positive and negative ascribes of the home-grown help,

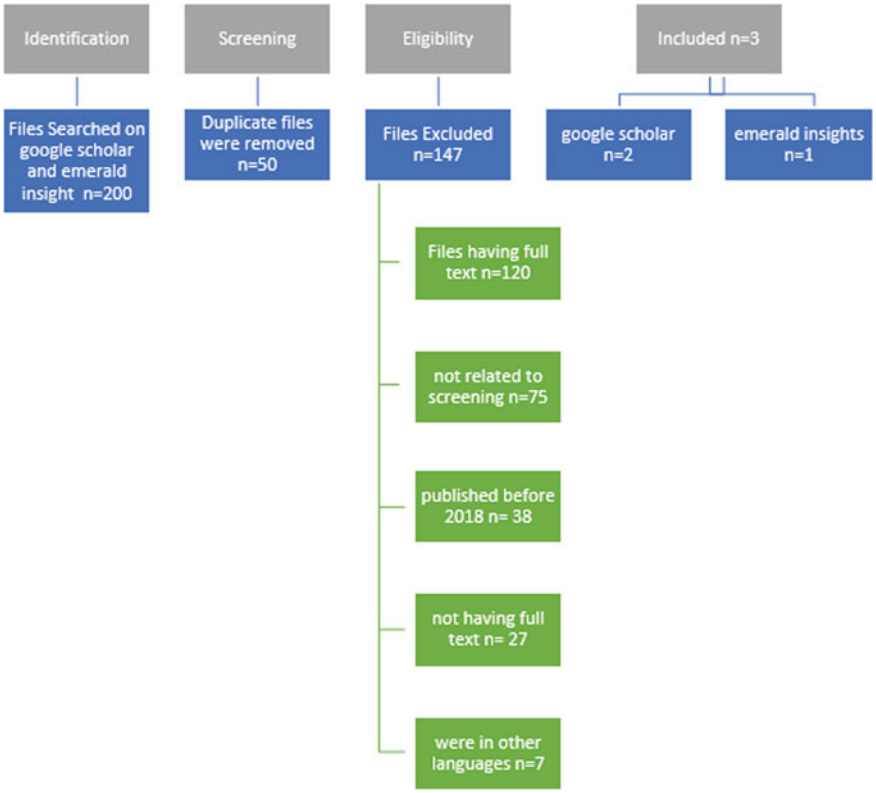

Fig. 1 Prisma chart (self-formed)

assist the important navigation, function as a source of perspective highlight balance past execution levels with the current ones and recognise mistakes and backing with reasonable solutions to be attempted. The literature review established that main execution indicators Key Performance Indicators are, for the most part, utilised in Facility Management for appraising the performance of the facilities as one of the important estimation devices. It is also maintained that the contribution of the facility management managers is significant in the study of value management, specifically with respect to answering the questions presented below:

6 Customer Satisfaction

The facility management managers should coordinate with the customers to recognise the need of the users and management businesses. The connection between the facility management and the society influences the sharing of skills appropriate to several aspects of the facility management with both the customers and the inventors. Earlier

Table 1 Data extraction table (Self-formed)

Reference	Country of Publishing	Participant Involvement	Aim	Methods	Outcomes	Limitations
Charef et al. (2018)	Europe	Studies contain stakeholders, businessman	The aim of the research is to proof the adoption in facility management and adequacy from the outlook of the management facility managers through the overview of various shareholder's outlook	The studies from databases cconcentrated on 28 European states as clear in the EU Commission website (2018) containing quantitative study	The data analysis raises the lack of consensus, and it is also highlighted on the digitization of the facility management	Limitations of having the great chance that the nature of operation where the information collection method is weak
Lu et al. (2018)	UK	Studies contain Businessman	The objective of the research is to determine the facility management manager during the building process can ensure sustainable policies which are not affected by following the facilities of delivery that plans and strategies which is kept up to Date	systematic literature searches of articles business literature from the user and organizational perspectives data and hand-searched the reference lists of retrieved articles containing qualitative	The results of this article give rise to advanced new claims and facilities	Limitation in having problems with models and selection Insufficient sample size for information measurements

(continued)

Table 1 (continued)

Reference	Country of Publishing	Participant Involvement	Aim	Methods	Outcomes	Limitations
Koch et al. (2019)	UK	Studies contain directors and patients	The aim of the research is to focus and highlighted the the significance of combination between the mechanical digitalization, abilities, association, and organisation of digital Facility Management	A community-based descriptive study	The outcome of the studies external advisors is involved, posing a problem of the in-house outsourced HR in the upcoming digital facility Management operation	The limitations of the study two case articles provide understandings, but those studies have the limited access on generalizability

studies have primarily shown the notion of significant creator interest in structuring all the activities at the occupancy stage. In many other studies, Wang et al. (2020) found that facility management helps in the training of the plan requirement. All the data are removed from the previous plans and buildings, which must be evaluated to grow design concerns for new services. The post-occupancy evaluations accordingly with the design of the facility which includes three main strategies (the high quality effect of organisational structures on the preferred results, the contribution of the organisation designs to cut off the non-relevant prices and increase the profits, and in last the effects of the organisational structure to improve the growth of human resources. Facility managers use the post-occupancy evaluation to improve building activities, and according to Stojanovic et al. (2018), the customer needs are frequently stated through the service level contract. The facility management services control the decision making of the facility management, which contain the growth of the administration, expenses, and human resources.

7 Sustainability

It has been decisively shown that numerous roles are required to involve and integrate sustainability into the value management study. It is also stated by Proskurin and Vorobeva (2019) that facility management manager must give the response of growth, including the sustainable issues. Though focusing too heavily on sustainable development, it might reduce problems at the macro-scale stage during the operational level, then the designs should have the capacity to lessen maintenance prices and ensure security. Pishdad-Bozorgi et al. (2018) reported that the active contribution of the facility management manager during the building process could also ensure sustainable policies which are not affected by following the facilities of delivery that plans and strategies which is kept up to Date. The usage of new materials and technological advancement could assist the control of energy consumption in the setting of adding up all the value of the current structures (Koch et al., 2019). The primary expert of the facility management is undoubtedly the facility director, away from the authorities stated above. According to Moretti et al. (2018) a facility director reports straight to the manager or top management of the organisation on facility matters and the performance. It is also received the official training in various skills like “human resource management skills”, economic, organisational skills, and practical skills to achieve the firm for the purpose of increasing business goals. It is more likely to guide and accomplish a facility organisation team, which helps the daily operations process in the office while focusing on the strategic office development and organising matters (Lu et al., 2018). Furthermore, a facility director is also called the business director, who is accountable for endorsing the administration’s efficiency and being protective of the workers’ excellence of life. Output is approved by the facility director by guaranteeing that each facility that is significant in manufacturing functions correctly and successfully, and as detailed above, each space in the office gives in output. A facility director defends the excellence of life on workers

by making comfortable and secure services and offices that assist workers doing the task efficiently. A facility director guarantees that no skill can generate harm, risk or threat to workers through preservation and regular examination of services. The business director, by accomplishing duties not only at the functioning level but also the corporate level, that has also performed jobs purposefully to make development and give the company a reasonable advantage. At the corporate level, a facility director needs to guarantee that facility policy plans match business planned strategies, capital costs are calculated and measured, worker productivity is exploited, and prices are minimalised and projected.

8 Digitalization and Performance Measurement in Facility Management

Immense information, internet effects and block cable are measured as digital technical tools in any business. Facility Management has been emerging through the close link with high technical developments in instant data and flexible statements. When the Digitalization Technology method started in the building, manufacturing, and the construction business, it was clear that workplace design was consecutively changed. Nowadays, the skill-driven variations in organisational work are moderately minor, though the full effects of current data and Public Services Skills on lessening the office service continue to be seen. An information management organisation for advantage care that can generate information and share data which is provided by the plan of the team associates who have a significant result on the activities of buildings. In the earlier units, the contributions of organization claims in Facility Management operations are argued with the previous case studies (Levo, 2021). The main aim of facility management is actually to support an organisation in increasing office management. The office, on the other hand, includes the individuals, the physical and fiscal resources, and the procedures and processes of a commercial; thus, the facility management activities should have an optimistic influence on these assets. Moreover, the planned aim of facility management is the actual organisation of facility assets and services in providing the primary support to all the operational processes of the organisations (Charef et al., 2018).

9 Building Information Model

Building Information Model is the procedure of data design and organisation for buildings through the design growth and process. The idea of the Building Information Model times back the previous year the 1970 and far along in the year 2000; it was effectively used mainly by the industry. Building Information Management was created from computer-assisted projects using Information and Communication

Technology and progressively established to generate BIM representations using the software equipment. The Building Information Model the idea was clear and studied in various research objects with different outlooks. This kind of research study specified the Building Information Model has features like the formation and sharing includes the data with other associates of the project. BI model was used as a tool for the improvement of sustainability of constructions by consuming the energy effectively and upholding a waste organisation procedure in the post created level in the organization. Building Information Model can be used for operational stage purposes with the great possibility, separately, for procedures and care management, the energy organisation, emergency organisation and quality organisation, along with the space organisation. Furthermore, BI Model is rarely applied in the operational phase, such as renovations and alterations. According to Kazado et al. (2019), the essential purpose of applying the Building Information Model is to make a facility notion that is nearly applicable to the complete development of a plan. BI Model used in the whole lifecycle of a project is applied Skill of producing, upholding, and using structure data for dealing with the operations and the strength preservation in their complete growth operations. The literature evaluation of study articles linked to Digitalization Technology of Facility Management specified that Facility Management has been developing with different certainty capture knowledge, such as involuntary ID, laser scanning, point influence and more, which can assist managers in gathering data about the operations of a created facility. Also, this expertise has enormous contributions to Facility Management as it allows facility executives and engineers to directly capture end users' requirements and preferences. Hosseini et al. (2018) claimed that knowledge of certainty charging deliver support by making digital models observing performance and certification. Evaluating Facility Management execution provides office managers with a clear summary of the strategy and plan of Facility Management. Decision taken by office managers for the policies generally vast effect on the effectiveness of facilities. Moreover, PM in Facility Management empowers resource managers to recognise the over a wide span of time operational productivity of the facilities and settle on compelling decisions for key preparation.

10 Project Stakeholder Management

Project "Stakeholder" Management includes the ways needed to identify the overall population, meetings, or connections that might disturb or be affected by the given task, to examine partner needs and their outcome on the responsibility, and to generate proper management techniques for effectively appealing partners in task selections and implementation. Partner management likewise focuses on constant communication with the partners to understand their needs and desires, inclining to matters as it happens, controlling clashing interests, and inspiring proper partner meetings in task picks and training. This contentment must be supervised as the main project aim. It is additionally characterised in the article that Preventive Management could be a proportion of how sufficient Facility Management is at recognising the necessities of

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the clients and its capacity to set up appropriate arrangements to fulfil such requirements and upgrade their worth. On the other hand, Ermolli (2019), represented PM as the most common way of evaluating progress towards acquiring pre-decided objectives, which remembers data for the proficiency as a way to such an extent that assets can be changed into labour and products, the nature of these results and yields and the adequacy of hierarchical destinations. Evaluating Facility Management execution provides office managers with a clear summary of the strategy and plan of Facility Management. Decision taken by office managers for the policies generally vast effect on the effectiveness of facilities. Moreover, PM in Facility Management empowers resource managers to recognise the over a wide span of time operational productivity of the facilities and settle on compelling decisions for key preparation. Emich (2020) opposed that PM refers to the ways of developing the sustainability of facilities by contributing the basic approaches to getting client fundamentals with least expenses and helps the course of asset shares and relocations. In the short-term, Dixit et al. (2019), placed that PM in The Key Performance Indicators can provide office managers with a precise examination to evaluate the performances of an office by utilising fitting boundaries produced from reviews and field studies. In their examination work, Che-Ani and Ali (2019) utilised a device of Key Performance Indicators coordinated from maintenance of board model to measure support of public consideration.

11 Conclusions

The study conducted mainly focused on the digitalization technology proof for its adoption in facility management and adequacy from the outlook of the management facility managers through the overview of various shareholder's outlook. In the first place the digitalized technology of the facility management has been discussed and the knowledge gap along with the service played an important role in this whole literature review. To conclude, the digital practices of the sustainable facility management are experiencing appraisal and transformation.

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A Review of Civilian Drones Systems, Applications, Benefits, Safety, and Security Challenges

Khalifa Al-Dosari, Ziad Hunaiti, and Wamadeva Balachandran

Abstract Among the plethora of technologies revolutionising modern life, Unmanned Aerial Systems, also known as self-piloting drones, offer scope for profound changes in a variety of applications across many sectors. Commercially available drones of various shapes and sizes serve numerable practical user needs. Drones are expected to achieve great economies and improve sustainability, but significant legislative and technical challenges face their adoption and deployment in many counties. This chapter reviews civilian drone systems, and their applications, benefits, safety, and security challenges.

Keywords Drones · Civilian drones systems · Applications · Benefits · Safety · Security challenges

1 Introduction

A drone is a vehicle capable of flying or propelling itself into the air without the need for an on-board human pilot. Airborne drones can be controlled from the ground using flight controllers, remote control, or a ground control centre (GCC). A flight controller or remote control can be used by civilians to control their drone, often (for visual applications) with a small mounted camera so that the operator can see what the drone sees (i.e., the surrounding environment). A GCC is usually used in large-scale projects, such as military research, to access a variety of information (e.g., for aerial monitoring or surveillance).

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_43

This chapter focuses on civilian drones, which come in various shapes and sizes, of which the four main commercially available civilian types are multi-rotor, fixed-wing, single-rotor helicopter, and fixed-wing hybrid VTOL drones (Smith, 2017). They all share essentially similar functional designs in terms of their flight properties, such as a fast-spinning propeller to generate enough thrust energy to lift the drone off the ground and stay afloat in the airspace. The selection of particular properties and specifications depends on the type or size of the drone and the intended application. For example, a relatively larger propeller with increased mass on a smaller drone would increase structural weight, which could actually inhibit drone flight. Therefore, a smaller propeller or the use of lightweight materials is more appropriate for smaller drone.

The most popular image of the application of drones is for localised aerial photography and recreational use, and potential delivery to consumers. This is the culmination of a long period of mainly military-led research and development, during which unmanned aerial vehicles and drones have evolved significantly. Drone research was particularly pioneered by the US Navy, which incorporated Sperry's three-axis gyroscopic flight control system (Altawy & Youssef, 2016) in a plane to test if it was able to fly on its own (unmanned). The first drone or unmanned plane was able to fly a distance of 1,000 yards. This time period was dominated by the prospect of world wars, and drone research thus had little interest in potential civilian applications. The prospect of the integration of drones into civilian life emerged during recent decades, commensurate with research into making drones safe for civilians, ensuring safety and security. The US Federal Aviation Administration (FAA) and the UK Fleet Air Arm are instrumental in the formulation of legislation and regulation governing drone production and use, for the safety of human operators, drones themselves and surrounding infrastructure and environments, and the general public.

While most commercial applications of drones nowadays relate to recreational use and aerial photography, there are many serious purposes and functions of drones, such as engineering inspections (e.g., to view structural integrity in accessible structures, such as offshore rigs or high-rise buildings, where direct human access would be expensive and difficult), monitoring sea level changes, and preparing evacuation plans for high-intensity rainfall events. Drones can also be used to help perform large-scale tasks productively, limiting the risk of human error. Aerial drones have applications that can benefit society by enabling the development of mapping technology, aerial photography, animal tracking, and delivery. These benefits can increase labour efficiency, produce aesthetic photographs or videos that add social value to product, and which can also provide political and economic value, by developing forecasting and mitigation methods for hazardous natural events to protect humans.

However, drones also raise challenges and concerns, which can be split into four categories: data and technical issues, privacy and ethics (mainly relating to personal data and privacy), security, and safety issues. The most direct potential threats of drones are unwanted surveillance and potential collisions with humans or infrastructure, causing injuries or damages. Cyber threats such as malware infecting the drone and allowing for unauthorised personnel to take control of the drone are issues that

human operators need to be cognisant of, along with physical threats to drones themselves, such as malicious vandalism or theft. Due to such issues, security, safety, and privacy measures are being enforced to keep the surrounding areas, communities, and drones safe. There are different mitigation strategies pertaining to the application of security and safety measures that can prevent or reduce risks.

Sense-and-avoid mechanisms are excellent for the prevention of collision with obstacles such as buildings or tress, especially if the human operator does not react fast, or visualisation and communication with the drone is cut or disrupted. In such contexts, drones can have artificial intelligence (AI) capabilities to make appropriate autonomous decisions in the field. Such strategies are useful and beneficial in maintaining the security and safety of the drone as well as its surroundings. However, there are also disadvantages associated with potential drone add-ons, most notably the financial, time, and training costs associated with the purchase, installation, and use of advanced programmes or mechanisms. Furthermore, drones with such defences still face costly mitigation strategies, which could deter human operators from buying them, and instead choose to purchase a cheaper drone that may not have effective mitigation strategies; put simply, drone purchasing decisions involve cost-safety trade-offs relative to particular applications.

2 History of Drones

2.1 Military Research and Development

In modern society, drones embody the peak of technological advancements in many fields, located at the convergence of aeronautical engineering, smart technologies, AI, digital photography, and renewable energy and sustainable solutions. However, the history of drones is long and extensive, and is firmly rooted in military applications, as mentioned previously. The first recognised drone was documented by the US Navy (Parsch, 2005), resulting from a research project led by Elmer Sperry, the founder of the flight navigation control firm Sperry Corporation (Altawy & Youssef, 2016). The drone ("three-axis gyroscopic flight control system") successfully flew down the River Seine in France a month before WWI began (Flight Journal, 2018). Based on this success, Peter Cooper Hewitt began the Automatic Airplane or Aerial Torpedo partnership with Sperry in late 1916, which was fitted with the Sperry system and was able to fly a distance of 1,000 yards autonomously, following pre-set mechanical commands. This event, which occurred on March 6, 1918, is considered the first substantive unmanned aircraft vehicle (UAV) flight.

The next invention was the Sperry-Curtiss "Pilotless Flying Bomb" (Fig. 1). This attempt at a cruise missile had minor success in 1918, combining cutting-edge aeroplane and munitions technology, both of which were being fast-tracked by WWI. It was never produced or used again, and by WWII jet engines and rocket technology became the main concerns of military research for the areas tentatively addressed by

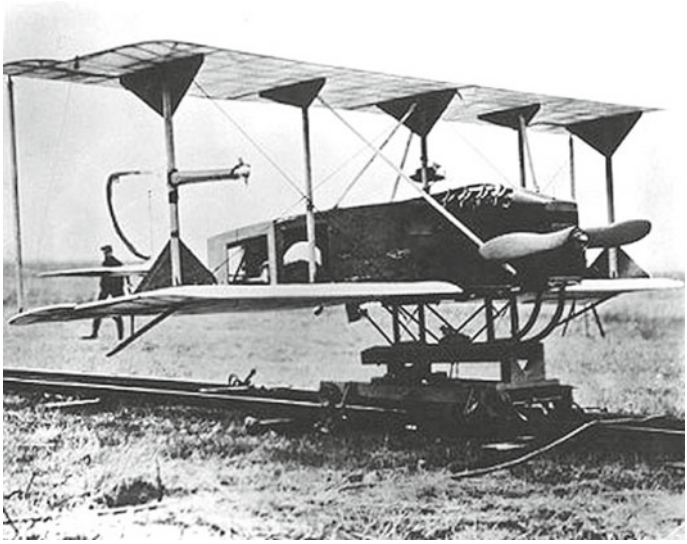

Fig. 1 "Pilotless flying bomb" (Parsch, 2005)

"drones" during WWI. There was a tentative resurgence of drones during the 1970s during the Vietnam War, for surveillance of Vietcong fighters and US prisoners of war, but more substantive use was evident in the widespread use of weaponised drones (in "drone strikes") by the US following the 2001 invasion of Afghanistan (Flight Journal, 2018). However, it should be noted that this was presaged by the use of drone reconnaissance during the US invasions of Panama (1989) and the Gulf War (1991) (O'Hanlon, 2011).

The main rationale for drone use was to minimise risks and casualties among US combat personnel (Satia, 2014). This lack of consequence for aggressors in drone strikes, and their technical imprecision, means that civilian massacres by drones have been one of the most egregious cases of US defence policy in Afghanistan, Iraq, and elsewhere, including the extra-judicial assassination of US citizens abroad, and legal provision for military drone strikes against US citizens within the US itself (posing legal and constitutional issues beyond the scope of this study) (Thompson, 2013). However, from the defence industry, drone development has been accompanied by conventional platitudes about the surgical nature of drone strikes and minimising civilian casualties, including the direct potential of drone observation of areas targeted for airstrikes to minimise civilian casualties (US Department of Defence, 2011).

2.2 Civilian Issues

Naturally, in the context of the carnage of the Western Front, these early military applications had no consideration of civilian safety, and they were in fact so limited in application that they posed no substantive threats. More recent military research and drone tests took place in US military testing grounds, with minimal human populations to get in the way (Altawy & Youssef, 2016). However, in the modern age, with the rapid deployment of commercial drones, civilian safety issues are paramount. The FAA and UK Fleet Air Arm are driving forces in reshaping the laws surrounding drones, with mandatory registrations of purchase and use of drones, to help identify any criminal uses (violating national airspace or conventional criminal laws). Drones are becoming a normalised commodity, accessible and serviceable to the public. Drones could be used for many purposes (mainly for aerial photography, mapping, and video recording), and may be deployed in commercial uses (such as delivery and transportation) and recreational applications (e.g., drone flying per se, racing with friends, entertainment, leisure, and photography) (Jones, 2017).

3 Different Types of Drones

There are four main types of drones commonly used by the general public, as mentioned previously: multi-rotor, fixed-wing, single-rotor helicopter, and fixed-wing hybrid VTOL drones (Smith, 2017).

Multi-rotor drones are widely used by creative industries and the academic sector, most commonly for aerial photography. These can be used in science research when observing inaccessible areas, such as densely forested green spaces, and to produce aerial digital content of urban landscapes. This type of drone is easier and cheaper to manufacture and use in comparison to other market-leading products. Multi-rotor drones are available in a number of different shapes and sizes, including a tricopter (with three rotors). However, these models have restricted flying time, rendering them unsuitable for long-term applications like mapping extensive areas and surveillance (Smith, 2017).

Fixed-wing drones have more particular design parameters than multi-rotor models, resembling the structure of a plane, with wing-like structures adorning the drone's main body to aid flight. They do not utilise energy to stay afloat, instead needing a remote unit for synchronous operation or implanted asynchronous guided control to remain airborne. This type of drone is more proficient for long-distance uses, and can be operated for long time periods, unlike the multi-rotor drone. These drones are more suitable for projects that need a huge distance or long hours, thus they are commonly used for aerial mapping or surveillance. However, they cannot be used for precise photography, due to their velocity of motion and inability to hover, although they are suitable for video-recording. This drone is relatively costly and requires expertise to operate (Smith, 2017).

Single-rotor drones resemble helicopter morphology. Whereas multi-rotor drones have multiple rotors, single-rotor drones have one eponymous rotor (accompanied by a smaller ancillary one on the tail, to control the heading). Much like the fixed-wing drones, this drone has long flying time, and it is more stable than the multi-rotor drone. However, it is complex and difficult to understand and operate. In addition, fatal injuries have been recorded with the use of this drone, and it could be very hazardous for inexperienced users (Smith, 2017).

Finally, hybrid VTOL is a drone model specialising in manual gliding and automation. Manual control or remote control or programmed flight course in the drone are some ways to control this drone. This drone has been used for commercial uses such as delivery services (Smith, 2017).

These four types are the most commonly used drones among the general public, and each has its particular advantages and disadvantages. They can all be used effectively for specific purposes, making them attractive to a customer in need of aerial support to execute various tasks. However, drone services come at the cost of dangers, for operators, infrastructure, and the general public. Drones are "airborne machines" that depend greatly on "cyber capabilities," which may pose many risks (Altawy & Youssef, 2016). The main risk of drones is collision, with people, property, or livestock etc. Drones could collide with airplanes when used (knowingly or unwittingly) in restricted airspace. Some units weigh over 10 kg (22 lbs), and any collision (particularly at high speed) can be catastrophic (Cerbair, 2020). While malfunctions are relatively rare in drones, bad weather or loss of battery are fundamental risks that can reduce operational efficiency and safety.

4 UAV/Drone System Architecture

Civilian drone technology utilises software to aid flight, ensuring its safety and security. Drones are available for purchase in a number of different sizes and shapes, depending on operator needs. A child could want a drone for entertainment purposes, and therefore purchase a small model, while a researcher who needs drones to map out the elevation of hills or mountains can purchase larger, high-specification models, equipped with different cameras and sensors to collect and generate large data sets. Figure 2 shows the design of a UAV in detail, illustrating the remote control and computer-based GCC methods of control. It shows the different vehicle properties and data links, and the individual components of a UAV (consisting of a propeller, compass, motor, and landing gear).

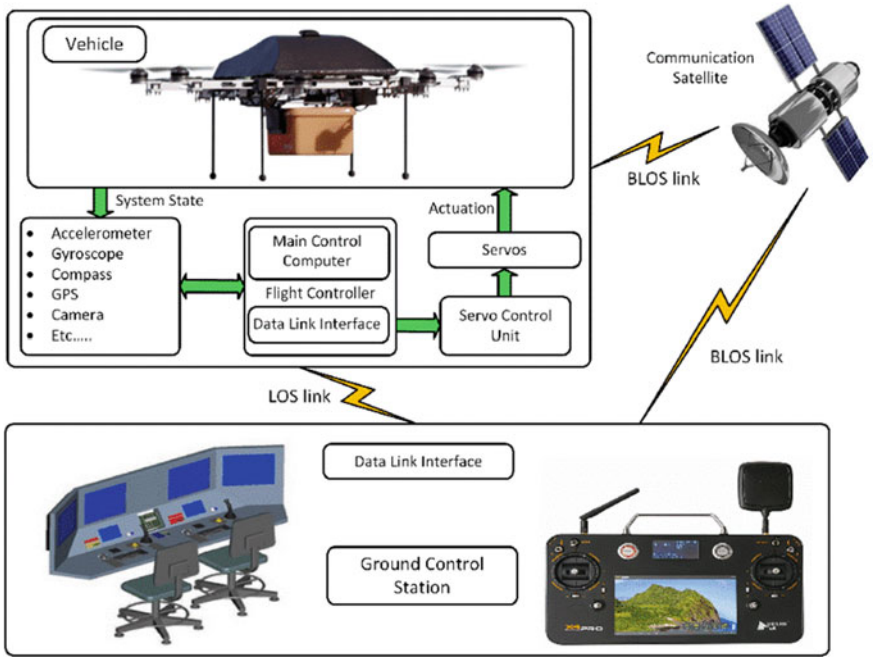

Fig. 2 Detailed overview of drone communication with human operator (Altawy & Youssef, 2016)

5 Civilian Drone Applications and Benefits

Technology advances relative to time and society moves forward with it. With drones evolving from one purpose to another, inevitably public access demand will increase. Previously, drones were very large and needed a GCC, but modern commercial and civilian drones are small, and only require a flight or remote controller. They have many applications that are beneficial to owners. The functions and purposes of drones are also increasing, which makes them more attractive to civilians who can afford to purchase them. These functions can vary from commercial to non-commercial sectors. The FAA suggests that the sales of civilian or commercial drones could approximately reach $2.7 million by 2020, which has important economic implications (Chang et al., 2017). Drone purchase and usage have the potential to improve and transform business, creating new industries and businesses, and cutting financial and environmental costs inherent in the current commercial delivery industry (Association for Unmanned Vehicle Systems International, 2013). The following subsections explore some of the applications of drones in more detail.

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5.1 Delivery

Businesses can use drones to deliver products directly to customers, door-to-door, whether direct from sellers or via courier drone services. Drones for delivering goods have been dubbed "parcelcopters" (Altawy & Youssef, 2016). These can be more closely integrated with supply chain management and logistics, reducing the potential for human error, such as losing parcels or delivering to the wrong address. In the Covid-19 context, drone delivery also limits inter-human contact involved in delivery, reducing virus transmission. Furthermore, customers can request deliveries at times convenient to them, with less human mediation, facilitating online ordering and shopping. Drone delivery can be more efficient, and can utilise renewable energy, thus reducing environmental pollution and transportation costs. Some estimates predict that local economies in the US can accrue approximately $20.8–34.8 million over the next 25 years (McIlrath, 2019).

5.2 Internet Access

UAVs can be used to provide Internet access to individuals who live in rural areas lacking accesses to conventional communication networks, which is increasingly essential in the era of smart technologies and global interconnectivity.

5.3 Cinematography and Aerial Photography

Filmmakers can use aerial drones to film areas that are hard to reach or inaccessible to humans. For example, drones can be used to video tape an area from the sky, should the scene need the tops of buildings. These drones create countless possibilities for creative scenes and give the opportunity for the filmmaker or photographers new platforms to expand their artworks (traditionally, helicopters were used for aerial shots used in films, which is extremely expensive). Drones can also be used to document intangible cultural heritage for 3D reconstruction and preservation. They are also used by individual photographers to capture pictures with a bird's eye view (Rango et al., 2006). Aerial photography is popular for both recreational and business purposes. Indeed, one of the main advantages of drones for many commercial users is their high-quality imaging and live streaming. Drones have cameras that can take high-quality photos and videos, and a wide range of high-resolution data, such as the exact coordinates of the location. This helps if a person wants to go back to the area. Drones can capture video footage in high resolution, and they are commonly used for live steaming events, important occasion, or memories. Drones can be used of live streaming for political events, such as presidential election debates, or for entertainment events such as music concerts.

5.4 Mapping

Drones can collect a variety of high-resolution data that can be used to create accurate 3D maps and models, which has numerous applications. For instance, this can discover erosion or conservation needs, and map disaster areas to streamline relief, ensuring that rescue teams understand the terrain and are equipped with pertinent knowledge before entering hazardous zones.

5.5 Agriculture and Crop Management

Drones can be used to perform specific tasks after system customisation, such as to fertilise, irrigate, or monitor crops, warning operators of particular water or nutritional deficiencies (Altawy & Youssef, 2016).

5.6 Construction

Construction activities or tasks can be aided by the use of civilian drones to accelerate data collection, improve data quality, and reduce the costs of data collection. Drones can help with different aspects of construction projects, such as in geological survey (McIlrath, 2019). This is beneficial as drones' multipurpose functions can assist a wide range of project stakeholders. The usage of drones for this purpose can also help with local economies, with potential benefits of $690.1–1,116.7 million over the next 25 years (McIlrath, 2019).

5.7 Ambulance and Medical Services

Drones can be used to deliver emergency response equipment or medication to different patients, which is especially important when human paramedics or doctors are unable to reach patients in a timely fashion. Traditional delivery methods may be hindered by a variety of reasons, particularly during emergencies such as natural disasters, so this drone function is highly useful. In terms of everyday healthcare services, "medical parcelcopter" drones are already used to deliver medication to patients. Ambulance drones can provide emergency medication when external roads are blocked by debris. They can also be equipped with monitoring sensors to assess the state of the survivors and report back to human paramedics or medical services the injuries or trauma of survivors, as well as being used to assess the general damage done by disasters.

5.8 Ensuring a Safe Environment Exists

Drones can be used to promote safe environments, enabling local authorities to monitor areas clearly and in live moments, instead of relying on CCTV that could be old, broken, or missing required coverage and footage. Drones can monitor situations and potentially be able to report potential threats to local authorities and warn people of potential dangers and unsafe conditions (Altawy & Youssef, 2016). For instance, drones equipped with cameras that can evaluate traffic patterns. This is beneficial in helping drivers avoid high risk areas and can reduce the risk of traffic collisions or accidents, and consequently casualties and deaths. Adding to the military uses discussed previously, drones also help to scope target sites and check areas prior to the deployment of human troops.

6 Civilian Drone Safety Challenges

Civilian drone challenges include those to application or programme used for the safety of the drone itself, or those to surrounding people and areas.

6.1 Weather

Different weather conditions, particularly storms, can hinder drone manoeuvrability and navigation systems. Different systems such as a sense-and-avoid or situational awareness must be implemented to ensure drone safety.

6.2 Friendly Drone Collision

It is not uncommon for multiple drones to be in use simultaneously, raising the potential for collision if operators are unable to react fast enough and steer their drones to safety. Sense-and-avoid systems or AI can be beneficial to avoid this issue.

6.3 Theft and Vandalism

Drones can be stolen or vandalised by humans if in close range. AI or a facial recognition systems can be used to avoid this issue.

6.4 Protective Programmes

Numerous protective programmes may be installed within the UAV to protect the surrounding environment, including people, property, and other aircraft from unexpected consequences of dribe operation, as described below.

6.4.1 Sense-and-Avoid

Sense-and-avoid systems allow aerial drones to autonomously detect potential collisions with other aircraft or aerial objects and to take evasive actions, dodging aerial hazards like a human pilot would, ensuring drone safety. This reduces the risk of the drone being damaged, and therefore minimises any repair costs. However, sense-and-avoid does not give a blanket guarantee of collision avoidance; the FAA regulation states that drones must deploy an automated sense and-avoid intelligent system that provides safety levels equal to or even exceeding that of manned aircraft (Altawy & Youssef, 2016). One example of how a drone senses and avoids a collision is a safety parachute system being activated when it senses that the drone is out of batter or terminated. This aids in minimising the damage when a collision is unavoidable.

6.4.2 Situational Awareness

Drones must possess a minimum level of situational awareness to ensure they are able to deal with any situation that may occur in their location. This system can predict real-time information and data about the location or situation to the human operator concerning weather and human population size (according to need). For example, weather data is useful to determine if it is an important factor in erosional landforms looking the way they do (when using drones for geological survey). The system could also have a thermal camera (Altawy & Youssef, 2016). Benefits of this awareness system are that it mitigates any risk of collision. It is able to sense and observe any collision obstacles and set a trajectory course to avoid them safely.

6.4.3 Artificial Intelligence

AI drones operate autonomously, without direct supervision by human operators. Algorithms allow drones to fly and react to their situation in a quick and responsive manner. AI mathematical features and control theory-based algorithms allow quick autonomous decisions and reactions. Civilian drones need to have some sort of AI capable of sensing danger or scanning for threats in the vicinity. After they sense this, they will then need the AI to out a reaction plan or different ways to avoid the threat. This type of drone could have tactical sensors to observe the area, or any changes

that could potentially harm the drone, and facial recognition software to allow only authorised personnel to access the system.

A localisation algorithm and technology could also be installed in AI drones to ensure they know where they are located, and where to go, should a human operator install co-ordinates for the drone to land at a specific time. This technology is beneficial as it can tell the drone where buildings are located, or which properties forbid the possibility of landing (e.g., should the batteries run out). Another advantage of this technology is that it is also able to tell the drone which airspace is illegal to enter, thereby reducing the risk of human owners or operators facing fines or criminal charges for trespass.

General benefits of AI algorithms installed in a drone mainly relate to improved capability to fly safely due to mathematical algorithms for collision avoidance and decision-making to avoid or respond to collisions. It can recognise operators or different locations, using facial recognition. AI capabilities are also essential in tasks in agriculture and military deployment due to faster reaction times than humans.

General disadvantages of this system include its expensive cost price, and objections to the use of facial recognition, and related privacy and security issues. Experienced programmers are also required to safely and successful implant AI programmes in drones, involving complex programming and long installation times. Additionally, the very efficiencies of AI drone systems can reduce employment in related fields rendered redundant by advanced technologies.

7 Cyber-Physical Security Challenges

7.1 General System Challenges

Cyber-physical security is created and then implemented in drones to protect different technologies and processes. The main components of a drone are a propulsion, autopilot, and recovery systems, aside from the physical structural airframe. Drones can be vulnerable to cyber attacks because of their dispersed physical systems. This can cause defective operation of the control loop, which is why cyber-physical security is necessary to ensure the security and effectiveness of the drone. Unauthorised personnel or attackers can manipulate drone processes and functions and misuse, such as denial of service attacks, whereby human operators lose all control of the drone. They can also sabotage operations, deny process or system functions, and corrupt data (Siddappaji et al., 2020).

However, drone cyber-physical security systems are quite efficient, and are able to deal with various real-world processes, adapting themselves to deal with changes in the surrounding area. They can perform calculations quickly, without wasting time, ensuring the safety and effectiveness of the drone, while avoiding obstacles or crashes (Siddappaji et al., 2020).

The main disadvantage of such systems is their cost. For an operator to ensure its drone is safe, they would need to have money on hand to install different security programmes to tackle different areas. They also only target certain areas, so again the operator would need to buy and install an ancillary system to deal with other processes that the cyber-physical security system does not address. These systems are relatively new to civilian drones, and therefore little research has studied their impacts, or potential installation in smaller drones (Altawy & Youssef, 2016). Also, the security community has started to identify categories and spectrums of emerging threats a civilian could encounter, and a lot of areas have been barely looked at (Altawy & Youssef, 2016).

7.2 Civilian Drone Security Challenges

7.2.1 Authentication

Aerial drones must have the means to ensure that only the authorised personnel can access them. They must be protected from hackers or cyber threats. One threat to a UAV is the possibility of it being hacked by unauthorised personnel who can then take control of the UAV, or inject falsified flight controller sensor data. A core security requirement of every drone is the guarantee that only authorised personnel can access the drone and its resources. Authentication mechanisms can implement distance protocols for authentication, determining the physical proximity of communicators within a system. This extra measure can mitigate spoofing attacks, as it is difficult for attackers to get close to the their target (Altawy & Youssef, 2016). This mechanism must be implemented in aerial drones to reduce chances of unauthorised personnel from either accessing the aerial drone or the GCC. It mitigates the risk of hacking or unauthorised personnel stealing the drone, or committing criminal acts with it.

This mechanism is beneficial as it allows the drone to always be safe from external threats. It reduces the risk of the authorised personnel accessing or stealing drones. This reduces the chance that the owner of the drone will need to pay for a new drone, or worry about the data such as photos taken on the drone being lost. It could also reduce the risk of insurance being paid for ether the stolen item or damages that the unauthorised personnel is creating with the drone. Other examples of mitigation techniques include cross-verification with readings from alternative sensors or firewalls. Cross-verification with readings from alternative sensors allows authorised personnel to ensure that the drone's main sensor has not been hijacked or is not displaying falsified data. Firewalls are beneficial and effective if they are implanted in drones, filtering threating from authorised communications. They are capable of excluding unauthorised communications, but they could be ineffective against malware, hence additional protection for the drone is required. This includes additional costs, and it can take time to install the new anti-malware or protection systems and programmes.

7.2.2 System Integrity

Common cyber threats of concern include unauthorised disclosure of the GCC, telemetric signals from the remote controller, and data stored within the drone. Aerial drones should be able to guarantee the authenticity of their software and hardware components, which consumer trust about their data being stored in hardware. Some trusted techniques that can help with this include memory curtaining, sealed storage, and remote attestation (Altawy & Youssef, 2016). Other ways to mitigate risks include the encryption of telemetric channels and data links, which guarantees the authenticity of system firmware and sensitive data. For extra protection, especially against viruses or malware, anti-virus software and firewalls can be used (Altawy & Youssef, 2016). These mitigation strategies are beneficial in reducing the risk of data falling into the wrong hands, and the costs of covering data breaches. If a business uses a drone for research or purposes, data breaches can cost an average of approximately $3.86 million (Ponemon Institute, 2018).

7.2.3 Accountability of Actions

The aerial drone should have multiple mechanisms to ensure operators of the drone are accountable and responsible for their actions. To do this an aerial drone can have a digital signature algorithm to authenticate operators and then to bind them to an issued action (Altawy & Youssef, 2016). In addition to this, logging procedures should also be implemented to track the sequence of actions in a chronological manner, tracking who executed what actions, and when. However, the possibility of holding the owner accountable for their actions using this mechanism is relatively low, as the drone is not able to physically stop the owner, who may have authorised remote accesses. On the other hand, drones could send alerts or warning messages to nearby police stations if owner actions are detected as potentially criminal.

Furthermore, laws and registration schemes are becoming more prevalent. In the UK for example, drone users must take an online test and pay a £9 fee licence per year if they wish to fly a drone weighing between 250 g and 20 kg. Other requirements are not exceeding an altitude of 400 ft above the ground or surface level (Cunliffe et al., 2017). If a user is caught flying a drone without a three-year flyer's ID or one-year operator ID they could face a fine of £1,000. This registration scheme has become mandatory due to civilian fears about the possibility of drone misuse, such as stalking and unauthorised voyeur photography. New laws and requirements brought by the UK's Civil Aviation Authority are a safety measure to identify the owners of a drone if unacceptable actions occur, making it easier to hold owners accountable. However, there is no way of knowing if everyone registers, particularly as drones become more widely available in supermarkets etc. and online, and therefore many illegal actions could go unnoticed. However, *effective* registration schemes can be advantageous in guaranteeing accountability in drone use.

7.2.4 Information Confidentiality

The confidentiality of telemetric information and GCC signals is a safety requirement that an aerial drone should protect, without which data can be disclosed to unauthorised personnel. One mitigation technique is the authentication of communication links or the encryption of data links. Aerial drones should be able to control the information being placed in them and keep it confidential, with systems and mechanisms to reduce the risk of unauthorised disclosure of telemetric and control information. Different encryption standards such as AES can be used for data link encryption, to enhance data security and strengthen protection and firewalls used to keep drone data confidential. Auto encryption of data is generally used for additional protection against unauthorised access, which avoids the costs of manual encryption and potential encryption errors.

Disadvantages of these methods include the minimal protection of data in transit, such as during transfer to a computer, and they slow down device speed to view data (e.g., possibly demanding an authentication key every time a user tries to access data). These factors also complicate data recovery.

7.2.5 Spoofing Attacks

Spoofing is a method by which unauthorised personnel or attackers disguise their manipulation or hacking into a system as something else, exploiting fake data or normal system aviation readings. This ensures that the owner or operator is not aware of the breach, and rather just thinks it is a normal system. Spoofing attacks render a variety of sensors redundant, further allowing the drone to be breached, whereby attackers can gain access to the server or networks, and to data or information stored within a drone. This threatens the integrity of telemetric information, control signals being sent form controller or control centre to the drone, and potentially to GPS locations. Some mitigation strategies against this include the installation of anti-malware, firewall, intrusion detection system, and defences against sensor readings being fabricated.

8 Key Challenges for Civilian Drone Safety and Security Applications

Civilian drones face challenges that can hinder deployment and cause serious harm to those around them, or to the drone itself. Drones are becoming increasingly popular, due to natural market development and improved commercial viability of drone purchasing, and the uptake of alternative hobbies following the Covid-19 pandemic and lockdown experiences. Business and education have started to move online or find new ways to adapt to modern technologies, and drone delivery to online customers

is a trailblazer in this process. The increasing proliferation of drone usage creates many challenges, which fall under four categories: design and technical, privacy and ethics, drone security, and drone safety challenges.

8.1 Design and Technical Challenges

Delayed responses to instructions can cause technical issues. The control of civilian drones is dependent on control signals from either the GCC or the flight controller/remote controller. Sometimes delays can occur; if the drone is far away from the main control signal, then information being sent form that point could delay reaching the drone. Consequently, the operator might instruct a drone to swerve to avoid an obstacle, but the lag time in communication can result in collisions and damage.

Injecting falsified sensor data is a challenge that can create technical issues and destabilisation for drones, by comprising some drone sensors by inserting false and fabricated readings in the sensors and flight controllers. This undermines the authorised personnel's control of the drone and causes the drone to be easily accessible by unauthorised personnel. The design of the civilian drone can make it easier for unauthorised personnel to manipulate the drone, such as through external influence on sensors, such as radar.

Malevolent and malicious hardware and software can create a lot of issues in the drone. The civilian flight controller can be vulnerable to software or hardware Trojans, which are viruses deigned to disrupt service, steal data, and otherwise inflict damaging actions on data or networks. In 2011 a Trojan was detected at a ground control unit in Creech (UK), which infected Royal Air Force systems with viruses and malware (Hartmann and Steup, 2018). One of the soldiers, a key-logger, found traces of malware in the operators of drones that flew over Iraq and Afghanistan. There was no consequence of this incident, but was security increased due to the worry that sensitive data was copied. This could happen to civilian drones if they are not properly protected. One example of a malware or virus that can impact negatively or infect a drone is a software known as Maldrone (Altawy & Youssef, 2016), which allows unauthorised personnel to control the drone by opening a back-door connection whereby it acts as a proxy for flight control, sensors, and all communications. The malware opens a back-doored connection with its botmaster to receive commands, enabling unwanted access to communication and data. Overall, this malware is able to grant the unauthorised personnel the opportunity to control and land the drone as they wish (Altawy & Youssef, 2016).

A more basic design challenge is the size of drones; relatively large drones can be intrusive and objectionable for the public. The visual perception of drones can lead to people feeling threatened, and the reality of the drone can create new notion and perceptions relating to security and privacy. Small drones generally do not scare people, and can make them feel at ease, particularly when there is no evidence of the presence of cameras. However, some people may also react in a negative manner or feel suspicious to smaller drones and potential stealthy surveillance activities.

People could worry that small drones could sneak into air vents or other small places and restricted locations within and outside buildings. Areas that are not accessible to humans can be accessed by drones undetected; a study on understanding human perception on drones found that people thought that drones smaller than the Parrot AR were preferable (Chang et al., 2017).

8.1.1 Privacy Ethics and Cultural Challenges (Personal Data)

The general reflexive public opinion of drones is that they do not feel safe with the idea of having civilian drones flying in the sky (Chang et al., 2017). There is a high possibility of such drones taking photos or videos of them, and the difficulty of knowing if drones are present (e.g., drones with long-range cameras) can make people scared and paranoid. People are worried about their privacy being violated by drones capable of surveillance, photography, and video-recording, which frightens people. The challenge therefore is to educate the public in understanding or accepting drones. They need to understand the ethical and legal frameworks prepared for responsible drone use. Drones have multiple functions that can assist human life, and understanding the different purposes could put people at ease. Legislation and regulation of drone ownership and use can also comfort the public, particularly with regard to data protection. Images or videos obtained from drones should not be used without the consent of subjects, and conventional data protection legislation should apply to drone footage and other data.

Ultimately, responsible drone use depends on the responsible actions of owners and operators, and the basic presumption of innocence and trust. However, this is not a realistic proposition given the easy potential for misuse and increasing drone usage makes it harder to detect and monitor drone activity. Unregistered users unknown to the government or other authorities can be harder to identity. Ineffective laws and regulation make it easier for civilian drones to be used in harmful and illegal ways that genuinely threaten civilians. Common ways drones can be misused for illegal purposes are unauthorised tracking and surveying people and property without consent, but criminal uses of drones can be as severe as terrorist attacks or targeted assassination (Altawy & Youssef, 2016).

8.1.2 Security of Drone Itself

The main challenges to drone security come from cyber threats. One way to endanger the security of a drone is through a cyberattack on the wireless link. Drones can be operated by computers or a remote control, which can take over on-board multiple networks of sensors and actuators, which normally feedback or communicate to the operator on the ground via a wireless link (Altawy & Youssef, 2016). This communication channel is vulnerable to cyber-attacks. An example of this occurring was when military operators lost control of a drone due to being taken over by unauthorised personnel employing a mix of cyber-attacks on unmanned aerial vehicles.

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All communications from the GCC to the drone were shut off by jamming both the ground control signals and the satellite. A GPS spoofing attach was employed by the unauthorised personnel into the feed of the unmanned aerial vehicle with a modified GPS data, which forced the drone to land in a new destination, while making the drone think it was landing back to its original destination that the military coded into it. This attack was carried out on a military drone, but the technology in this drone can be similar to civilian ones. The approach employed by the unauthorised personnel can be used to hijack a civilian drone.

A physical or cyber attack on the flight control or GCC causes the drone to be unmanned. This can create malfunctions within the drone, causing it to crash and potentially cause harm, due to the drone's dependence on information being fed to it from the flight controller or GCC. This is achieved via a data link and a sensor feeding back information about the surrounding environment. If unauthorised personnel are able to manipulate the internal communication system or data link they can falsify data, making the operator think they are in control, or making the drone think it has not been hijacked, therefore safety measures are not activated to counter the attack.

8.1.3 Safety of Drone Itself

Physical damage to the drone interacting with its surroundings is a safety issue. Collison is the main risk threatening drones and objects with which they collide. Inexperienced or amateur operators can easily accidently collide with other drones or with objects, and the drone may lose connectivity with the flight controller in the hands of the operator. Collision with people or animals can cause injuries or even death, and collision with infrastructure (e.g., buildings) can completely destroy the drone, and potentially cause criminal damage (Chang et al., 2017). For a successful and safe drone flight, the operator needs to see what the drone sees, and thus when to dodge or turn left or right if an obstacle is in the flightpath. Video footage captured by drones mounted with cameras is beneficial for collision avoidance and navigation, keeping the drone safe and reducing the risk of damage. An operator requests live video footage from the kernel of the operating system via a computer by issuing a system call. Unauthorised personnel or attackers who have knowledge of the system and its parameters are also able to gain access to the flight controller via this route. They can intercept the system call that the operator issues to the kernel, and then fabricate the footage that the operator sees. With a GPS spoofing attack, the attacker has full control of the drone.

This can consequently lead to the operator thinking they have control of the drone, when in reality the attacker has the control. The attacker can then land the drone with no consequence from the operator. Having the drone stolen or vandalised is an issue that operators could face. Flying low to the ground or at a distance that is easily seen by people makes drones attractive targets to thieves, and targets of vandals. There are multiple ways in which a drone can be brought down, such as dart guns and rifles, or physically grabbing it (e.g., with a net) if the drone is low enough. Police are issued with specialist anti-drone rifles, to shoot down drones in violation of laws (e.g.,

unlawful surveillance of civilians). These rifles are designed and created to disable drones immediately, without damaging them. They use radio pulses to disrupt the data link communication within a drone, forcing the drone to activate failsafe protocols, whereby it hovers closer to the ground in preparation to land safely. As mentioned above in relation to security challenges, the use of malware and software can be used to bring a drone down. The intentional infection of a software virus, such as Maldrone, can bring a drone down, whereby attackers can retrieved the drone from the landing site.

9 Summary and Conclusion

This chapter explains the history of UAVs, the architecture of drones, different applications and mechanisms within drones, and associated benefits and challenges. We have also classified the different types of cyber and physical attacks that can affect private and public sector drones, as well as the different techniques used for this to occur. Some case studies and examples have been explored to evidence common attack methods. Mitigation strategies have been provided to inform operators of the different safety techniques available. Finally, we have also discussed the consequences of drone use on civilian privacy. In conclusion, drones have great potential to modernise and digitise many industries, but there are number of challenges that need to be seriously addressed in order to facilitate the appropriate deployment of drones applications, in order to ensure the safety and security of drones and people.

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How to Build a Risk Management Culture that Supports Diffusion of Innovation? A Systematic Review

Mohammad N. Y. Hirzallah and Muhammad Turki Alshurideh

Abstract This research paper aimed to produce a systematic review of two of the critical terms in any organisation: risk management (RM) and diffusion of innovation (DOINV). The research sought to examine the relationship between RM and DOINV. The systematic review comprised 27 articles published from 2007 to 2020 sourced from different databases, such as; ProQuest, Emerald, ScienceDirect, IEEE, Scopus, and Google Scholar. A set of inclusion and exclusion criteria were used to filter the results, which were then assessed using a quality assessment process. Factors that appeared more frequently were highlighted as the main findings for future study. A proposed framework for future study was also defined at that point. Next, a comprehensive analysis was conducted on the 27 selected articles to answer the five research questions. This researches' main finding of this research was that a risk management culture positively supported the diffusion of innovation in firms. Several factors affected this relationship, such as; organisation learning, intellectual capital, human resources management, information technology, soft total quality management, knowledge management practice, strategy and structure.

Keywords Systematic review · Risk management · Firm performance · Diffusion of innovation

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_44

1 Introduction

Establishing something new is the essence of product innovation. Since this process necessarily involves early risk identification and management are required in innovative firms. Therefore, this paper aims to explore methods for managing risk in the diffusion of innovation. At the same time, the proposed method for managing risk in a prespecified innovation will be further explained. Risk is inherent to the activities of innovation companies; managing such risks represents an opportunity for companies to improve their capability to achieve their goals. The market of innovation development has been increasing, year by year, encompassing a greater and greater share of the economy. It is different from other industries because it consists of many small companies (Lowman et al., 2012). Together with other countries with more developed economies, the UAE has conducted a great deal of research related to this topic. In contrast, the number of such studies in developing countries has been limited (Nagano et al., 2014).

1.1 Research Questions

This systematic review has focused on the relationship between risk management culture and diffusion of innovation and has studied the factors and variables that affect this relationship. More precisely, this review performed its analysis by answering the research questions below:

RQ1: What are the primary research purposes of the studies selected?
RQ2: What are the main research methods of the studies selected?
RQ3: What are the participating countries in the context of the studies selected?
RQ4: What is the context of the studies selected?
RQ5: What is the study distribution by publication year regarding RM and DOINV?

1.2 Research Objectives

This systematic review has focused on developing many skills for new DBA students, such as:

1. Using different databases to develop research skills and techniques.
2. Learning the systematic review process.
3. Expanding knowledge concerning the search topic.
4. Discovering the factors affecting the relationship between RM and DOINV.
5. Creating ideas about future studies concerning the same topic.

1.3 Research Importance

Many firms have used RM as a competitive advantage. If risks are managed correctly between all parties in an organisation, everyone will act positively to achieve the organisation's goals and objectives. This study will help researchers see what other researchers have already achieved in this field, build from where others have stopped, and understand the various issues related to this topic: RM and DOINV—in addition to exploring the factors that affect the relationship between RM and DOINV. Finally, learning how to conduct a systematic review.

2 Literature Review

2.1 Risk Management

For companies to launch new products speedily and successfully, taking risks is essential. The ability to identify and manage risk is vitally important in risky innovation.

Definition

There has not been a single, universally accepted definition of the word risk (Green and Serbein, 1983). Its definition has changed as it has become interwoven with innovation and the rapidly globalising world. Companies that wish to survive need to innovate at a previously unparalleled rates and within a framework of greater uncertainty. This situation means their risks are deepening (Taplin, 2005). In more technical and specialised literature, as Kalvet and Lember (2010) pointed out, the word risk implies the measurement of the chance of an outcome, the size of the outcome, or a combination of both. According to the standard definition of risk, it is "the combination of the frequency or probability of occurrence and the consequence of a specified hazardous event"(Edwards et al., 2005). Some former writers in this field have distinguished between uncertainty and risk.

A risk situation is defined as a probability distribution for consequences is made on a meaningful basis, agreed upon by a set of relevant experts, and therefore it is 'known'. Uncertain situations arise when an agreement among experts cannot be gained, so there will be an undefined probability distribution on the set of outcomes (Vargas-Hernández, 2011).

Sources of Risk

Any factor affecting project performance can cause risk, and when this effect is both significant and uncertain on project performance, risk arises (Chapman & Ward, 1997). Fort-Rioche and Ackermann (2013) argued that categorising risk in a simple manner could be very unhelpful since such categories could be viewed independently. Thus, when considering a wider range of risk categories, it is important to consider

more than just the risks themselves and their impact on one another. Risk should be considered systemic to represent the different aspects of risk accurately. According to their research, categorisation comprised; political, partner and supplier, customer, people, reputation, financial and market.

Following Vargas-Hernández (2011), an enterprise's risk aspects may be placed under the following major categories: property and personnel, marketing, finance, personnel and production and environment. Therefore, by considering the different sources of risk and the purpose of this paper, the best risk categorisation for this research work was as follows:

- Environment (exchange rates, availability of skilled labour, government policy, culture, weather).
- Technical (materials, new methods, technologies).
- Resources (materials, staff, finance).
- Integration (old and new systems, software modules).
- Management (experience, multiple parties, use of project management techniques, product transition management, set tight goals, HRM, organisation behaviour, organisation structure).
- Marketing (competitors, customers).
- Strategy.

Risk Management System

Risk management is acknowledged as 'the process of understanding the nature of uncertain future events and making positive plans to mitigate them where they present a threat or take advantage of them where they present opportunities' (Taplin, 2005). Considering that one of the main features of innovation is 'risk', risk management should facilitate innovation rather than stifle it (Taplin, 2005). Systematic risk management enhances an organisation's ability to manage risks. Risk management aims to improve project performance using; systematic identification, appraisal, and management of project-related risk (Chapman & Ward, 1997).Systematic risk management encourages decision-making inside an organisation that is more controlled, consistent, and flexible (Edwards et al., 2005). Following Edwards et al. (2005), it can be said that good risk management for a project should encompass these processes:

- Establishing appropriate context(s).
- Recognising project risk that faced by a stakeholder organisation.
- Analysing identified risks.
- Developing risk responses.
- Supervising and monitoring risks throughout a project.
- Permitting post-project collection of risk knowledge.

2.2 Innovation Diffusion

According to Mokyr (2002), innovation is the main source of economic growth, a key source of new employment opportunities, and has the potential to realise environmental benefits (Foxon et al., 2005). It is widely argued that in the current global economy, economic actions can be more cheaply conducted in low-wage economies, such as China. Therefore the main way in which other economies can compete and survive is for them to discover new and improved processes and products, in other words, they must innovate (Salaman & Storey, 2005).

Definition

The Oxford Dictionary of Economics states that innovation refers to the economic application of a new idea. Product innovation involves a modified or new product; process innovation involves a modified or new process of making a product (Black et al., 2006). Afuah (2003) stated that innovation involves the employment of new knowledge to provide a new product or service that the customers want; in other words, it is invention plus commercialisation. Van de Ven (1986) designated innovation as a new idea, which may be; a recombination of old ideas, a plan that challenges the present order, a formula, or an exclusive method that is perceived as new by individuals involved.

Different Innovation Types

The existing literature provides different innovation categories classified by; competence, degree, type, ownership and impact (Narvekar & Jain, 2006). Innovation can be considered in service and manufacturing sectors of different sizes (large, medium, and small). Although these two sectors differ, the general definition and innovation process is the same. The services sector has different characteristics from manufacturing. For instance, services are; perishable, intangible and heterogeneous (Salaman & Storey, 2005; Alshurideh et al., 2012; Alshurideh et al., 2021; Alshurideh, 2022).

Tidd and Hull (2006) stated that innovation was not just about opening new markets; it can also present new ways of serving older and established ones. He classified innovation into four groups (Product, Process, Position, and Paradigm), where each can happen along an axis, running from incremental through radical change. Incremental product innovation entails introducing an improved product, which, compared with its predecessor, has at least one additional desirable characteristic or is more efficient with the same characteristics. In contrast, radical or fundamental product innovation occurs when a new market has opened up, and the innovator begins to satisfy a hidden demand (Arundel et al., 2019).

3 Methods

This assessment used a systematic review of risk management and innovation. The research went through many stages, including; defining exclusion and inclusion criteria, selecting data sources and the search strategy, a quality assessment process, and data coding and analysis. These stages are detailed further in the subsequent subsections.

3.1 Exclusion/Inclusion Criteria

The exclusion and inclusion criteria were set up to support conducting this research. Firstly, the searched articles needed to involve risk management and innovation for the inclusion criteria. Secondly, the reviewed articles were required to show the relationship between RM and innovation. Thirdly the included articles needed to have been published between 2007 and 2020. Fourthly the articles needed to be written in the English language. Finally, the included articles should not include sector indicators.

Regarding the exclusion criteria, firstly, articles with technical backgrounds were excluded. Secondly, older articles published before 2007 concerning risk management and innovation were excluded. Finally, articles not written in English were excluded. Table 1 presents the exclusion and inclusion criteria used by this research work.

3.2 Research Strategies and Data Sources

Several databases and research engines were used to conduct this systematic literature review, such as; ProQuest, Emerald, Google Scholar, IEEE, Scopus, and ScienceDirect. The Search terms used were "risk management and innovation. In the identification stage, the results presented 1361 articles from the mentioned search engines and databases. In the screening stage, the results were filtered, and any duplicated articles were removed; most of the duplicates came from Google Scholar. The results were

Table 1 Exclusion and inclusion criteria

Inclusion criteria	Exclusion criteria
• Should involve risk management and innovation • Should show the relationship between innovation and RM • No sector indicators • Published between 2007 and 2020 • Must use the English language	• Articles with technical backgrounds • Non-English language • Articles published before 2007

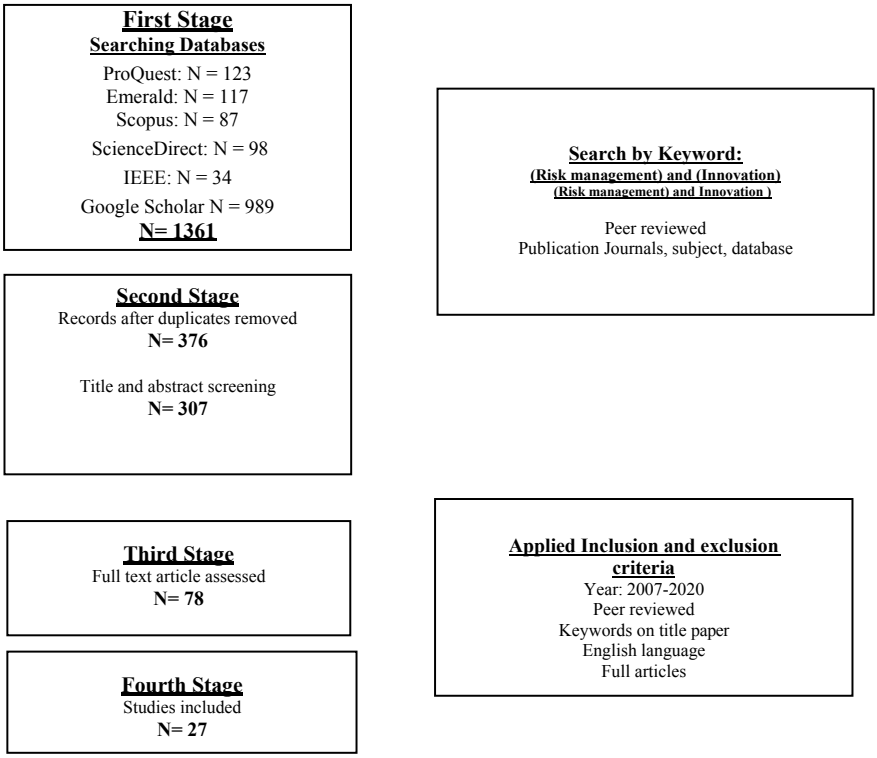

Fig. 1 Flowchart for the selected studies

limited to only show peer-reviewed articles published from 2007 to 2020; the result comprised 376 articles. Following that, the titles and abstracts of all articles were checked, reducing to 307 the number of shown articles. Then the full articles and keywords included in the title were requested, which reduced the resulting articles to 78 in the eligibility stage. The exclusion and inclusion criteria were next applied for all articles, which reduced the shown articles to 27 in the final stage. The flowchart of the selected study is illustrated in Fig. 1 (Tables 2, 3, 4, 5, 6, 7, and 8).

3.3 Quality Assessment

To check the quality of the research studies in this research, "Quality assessment." was used similarly to how Da Silva Etges and Cortimiglia (2019) used it in his paper "A systematic review of Risk Management in Innovation-oriented Firms" as it's easy to use and gave an excellent way to evaluate the articles. The quality assessment contained nine questions to investigate the quality of the selected articles. There

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Table 2 Data sources and databases

#	Search engine/database	Total articles 1st stage	Total articles 2nd stage	Total articles 3rd stage	Total articles 4th stage
1	ProQuest	123	89	24	6
2	Emerald	117	42	5	3
3	ScienceDirect	98	71	11	2
4	Scopus	87	63	14	5
5	IEEE	34	9	5	4
6	Google Scholar	989	102	19	7
	Total	**1361**	**376**	**78**	**27**

was a three-point scale. YES was worth one point, NO was worth zero points, and particularly was worth 0.5 points. Each study was scored between 0 and 9.

3.4 Analysis and Data Coding

This research's methodology quality was coded including; 1: research purpose 2: methods. 3: country. 4: context. 5: year of publication as other studied such as (Aisha Alshamsi et al., 2020; Al Mehrez et al., 2020; Assad & Alshurideh, 2020; Al Suwaidi et al., 2020; Ahmad et al., 2021; Ahmed et al., 2021; Almazrouei et al., 2021; Al Khayyal et al., 2021; Alshamsi et al., 2021; AlShehhi et al., 2021) did. The answers from this group of questions provided a precise representation of the paper's quality. A researcher can, at this point, include many articles by answering the five following questions:

RQ1: What are the primary research purposes of the studies selected?
RQ2: What are the main research methods of the studies selected?
RQ3: What are the participating countries in the context of the studies selected?
RQ4: What is the context of the studies selected?
RQ5: In terms of RM and innovation, what is the study distribution by year of publication?

Based on the selected 27 research articles concerning risk management and diffusion of innovation from 2007 to 2020. The systematic review results were analysed related to the answers to the above five questions.

RQ1: Research purpose distribution

The country of origin was developed as a crucial indicator to analyse the articles in this systematic review. This procedure helped to analyse the articles according to their purpose.

Table 3 Analysis of included research articles

No.	Authors	Year	Place	Context	Data collection methods	Sample size
S1	Da Silva Etges and Cortimiglia (2019)	2019	Brazil	Innovation oriented firms	Systematic review and empirical study	115 works
S2	Jin and Navare (2010)	2010	UK	Liverpool Victoria	Case study approach	One organisation
S3	Kwak et al. (2018)	2018	South Korea	Manufacturers and logistics intermediaries	Quantitative approach	
S4	Borgelt and Falk (2007)	2007	Australia	Three large organisations	Qualitative and case study methodology	60 leaders and managers
S5	Andersen (2009)	2009	Denmark	Different manufacturing industries	Quantitative approach	896 companies
S6	Chiambaretto et al. (2020)	2020	Sweden	Swedish firms	Quantitative approach	786 innovative Swedish firms with 50 to 1000 employees
S7	Wehn and Evers (2015)	2015	Netherlands	Citizen observations	Case study approach	2 Case Studies
S8	Migliori et al. (2020)	2020	Italy	Small and medium-sized family firms	Quantitative approach	1093 Italian small and medium-sized family firms
S9	Koru et al. (2018)	2018	United States	Home health agencies (HHAs)	Qualitative analysis	347 reports entered by HHA clinicians
S10	Games and Rendi (2019)	2019	Indonesia	Small and medium enterprises (SMEs)	Quantitative approach	165 small business owners in creative industries
S11	Ab Rahman et al. (2015)	2015	Malaysia	AIM participants	Quantitative approach	10 participant companies

(continued)

Table 3 (continued)

No.	Authors	Year	Place	Context	Data collection methods	Sample size
S12	Izumi et al. (2019)	2019	Japan	Academia, government, NGOs, and the private sector	Quantitative approach	A total of 228 answers were received from; universities and research institutes (145), government (30), NGOs (24), international and regional organisations (16), the private sector (6)
S13	Da Silva Etges et al. (2018)	2018	USA & Brazil	Hospitals in the United States and Brazil	Qualitative analysis	This study incorporated interviews with 15 chief risk officers (8 from the United States and 7 from Brazil)
S14	Wu and Wu (2014)	2014	China	Chinese firms	Quantitative approach	Panel data from a survey of 1178 Chinese firms
S15	Puente et al. (2019)	2019	Spain	Large pharmaceutical laboratories	Systematic analysis	31 large pharmaceutical laboratories
S16	Röth and Spieth (2019)	2019	Germany	Innovation projects	Semantic priming	455 participants
S17	Barczak et al. (2019)	2019	Poland	Micro, small, medium, and large enterprises	Quantitative approach	360 full interviews
S18	Ali et al. (2017)	2017	USA	Academic papers	Qualitative literature review and systematic review	31 academic papers
S19	Hock-Doepgen et al. (2021)	2021	Germany	Small and medium-sized enterprises (SMEs)	Qualitative comparative analysis	197 small and medium-sized enterprises (SMEs)
S20	Etges et al. (2017)	2017	Brazil	Innovative enterprises	Quantitative analysis	13 innovative companies

(continued)

Table 3 (continued)

No.	Authors	Year	Place	Context	Data collection methods	Sample size
S21	Bowers and Khorakian (2014)	2014	Iran and the UK	Large companies	Qualitative analysis	40 interviews
S22	Gurd and Helliar (2017)	2017	Australia	Zeta and Eta companies	Case study approach	Two case studies
S23	Vargas-Hernandez and Garcia-Santillan, (2011)	2011	Mexico	Innovation projects in lightweight medical	Case study and qualitative approach	One case
S24	Hölttä-Otto et al. (2015)	2015	United States	Kickstarter and Indiegogo customers	Quantitative Approach	127 consumers
S25	Berglund (2007)	2007	Sweden	Large corporations	Case study approach	Two cases
S26	O'Connor et al. (2008)	2008	USA	Large firms	Literature sharing and meetings with the IRI membership. Two longitudinal cross-case qualitative studies	85 high-level individuals
S27	Kalvet and Lember (2010)	2010	Estonia	Public procurement	Case study approach	Five case studies

Table 4 Articles included in this study with purpose, findings, and limitations

No.	Third term	Purpose	Finding	Limitations
S1	Ffinancial impact	The proposed framework was the first necessary state for future development. this study identified that innovation-oriented firms would provide a first empirical test of the interpretative framework of risk events, particularly regarding the comprehensive completeness of the proposed framework as perceived by practitioners	The main contribution of this paper was the proposal of a synthesising interpretative framework of risk events that could support the future development of payment ERM models for innovation-oriented firms. Additionally,	The empirical study signalled which risk events were more relevant in the Brazilian context, limited to discussing specific aspects of operational implementation
S2	Global sustainability (GS)	Determining the relationship between risk and innovative adoptive behaviour was examined to guide managers on managing risk and uncertainty under the different circumstances of their innovative practices	The study developed a conceptual framework, which consisted of; risk behaviour, environmental conditions, and innovation. Two key elements determined the performance of such behaviour	The research was only exploratory and used a single case study to illustrate the applicability of the REAI model The boundary and conditions of such applications were not specified. Therefore, there remains a need to test the REAI model using a large representative sample. Given that it takes a relatively long period to observe environmental turbulence and organisational behaviour changes, it is also essential to carry out such a study from a longitudinal perspective
S3	Supply chain	This paper proposed and validated a theoretical model to investigate whether supply chain (SC) innovation positively affected risk management capabilities, such as robustness and resilience in global SC operations. It also examined how these capabilities may improve competitive advantage	It was found that innovative SCs had a discernible positive influence on all dimensions of risk management capability, which in turn had a significant impact on enhancing competitive advantage Therefore, this research provided evidence on SC innovation and risk management capabilities in supporting competitive advantage	This research did not use objective data to measure the firm's competitive advantage but employed the respondents' perceptions of their competitive advantage. The impact of risk management capability on competitive advantage might take a long time. Data were collected from a single country, South Korea

(continued)

Table 4 (continued)

No.	Third term	Purpose	Finding	Limitations
S4	Leadership	This paper presented a data-driven discussion concerning whether effective leadership and innovation were being stifled in contemporary organisational environments of continuous change	The key finding was that the accurate application of interaction between leadership and management released social capital and related identity and knowledge resources, helping address tension between risk management and innovation	This paper only reported on one component of the original study. The findings and implications reported here are regarded as tentative
S5	Capital structure	This paper argued that strategic responsiveness was of paramount importance for effective risk management outcomes and demonstrated this by introducing an empirical study	The study revealed that risk management effectiveness combined the ability to exploit opportunities and avoid adverse economic impacts and had a significant positive relationship with performance. This effect was moderated favourably by investment in innovation and lower financial leverage	The analysis was based on a sample of large firms, which may have affected the generalisability of the results. Nonetheless, the study showed that effective RM capabilities differentiated firms and determined success and failure. It further underscored the importance of combined innovation policy and capital structure decisions as firms deal effectively with risk and uncertainty
S6	Small and large firms	This research investigated the extent to which small, and large firms differed when assessing the benefits and risks provided by competitors as partners in innovation	This paper's results confirmed that small and large firms valued the benefits and risks associated with competitors differently. It showed that small firms were less reluctant to compete than large firms, especially if the competition allowed them to reduce their costs and learn from their competitor. In contrast, it showed that large firms' agreed to cooperate with their competitors to enable them to reduce their time-to-market	The method used did not allow the researchers to investigate other attributes that might be equally or even more important. Second, the participants were forced to select a competitor for innovation based on only a few limited attributes, which were limited by the number of respondents
S7	Flood risk management	This paper analysed the social innovation potential of ICT-enabled citizen observations to increase e-participation in local flood risk management	This study analysed the social innovation potential of ICT-enabled citizen observations to increase e-participation in local flood risk management	The limitation of this research was its focus on only two cases. Further investigation is required to confirm the findings based on more cases

(continued)

Table 4 (continued)

No.	Third term	Purpose	Finding	Limitations
S8	Family management	This paper investigated the relationship between family management and innovation investment propensity in family firms by analysing the effect of two innovation impulses: demand-pull and technology-push. Extending the technology-push/demand-pull framework in the context of family firms, and adopting a direct measure of firms' innovation investment propensity	The findings suggested to practitioners and policymakers that family firm innovation impulses were important contingencies that needed to be considered when making innovation investment decisions. Other findings suggested that the effect of FTMT on INN_PRO was statistically significant. Additionally, the findings suggested that the TP impulse was less decisive than the DP impulse	First, the investigation was focused on Italian family firms. Second, the study adopted a cross-sectional analysis given that the dataset covered the period 2007–2009. Third, the study measured the DP and TP variables following some prior studies. Fourth, the sample and the family business definition was adopted. Finally, the focus was on family SMEs rather than medium or large firms
S9	Technology	The study performed a detailed examination of fall and near-fall incidents in an HHA to identify potential IT-based innovations that could be used in process improvement to achieve better fall risk management during home care	The results provided data about fall risk management during home care. The results suggested methods that could positively respond to the challenges and opportunities identified in the current study to impact fall risk management during home care positively	The perspectives of patients and caregivers related to fall incidents were not captured
S10	Financial performance	This study examined the effects of knowledge management and risk-taking on financial performance where negative innovation outcomes were chosen as a mediator variable	The study results indicated the importance of knowledge management and risk-taking to reduce negative innovation outcomes. Further, it was found that negative innovation outcomes did not mediate the links between knowledge management, risk-taking, and SMEs' financial performance	The study offered some insights from Indonesia as an emerging market economy, which may have had different characteristics from other contexts. Secondly, most respondents were newly in business and perhaps saw business innovation imperative in creative industries. Thirdly, it may also not be sufficient to see the result of the implementation of risk management. Fourthly, this research did not include positive innovation outcomes as a mediator variable. This study saw negative innovation outcomes as sufficient to see the impact of knowledge management and risk-taking

(continued)

Table 4 (continued)

No.	Third term	Purpose	Finding	Limitations
S11	Sustainability of microfinance	This study clarified issues around whether measures had a positive effect on different aspects of innovation and best practices	The study findings showed that performance measurement positively affected innovation and best practice issues. The measurements for several aspects of innovation and best practices had good potential in the microfinance industry	The study's main limitation descended from its exploratory nature because the objective was to gain theoretical clarification regarding the product innovation process and best practices. The findings were generalised, which limited the study
S12	Disaster management	This paper identified three key issues that could help overcome the following barriers: networking, eco-production of knowledge, and a stronger role played by academia	This paper clearly showed that innovations were not required to be completely new or high-tech products, as approaches and frameworks could lead to changes and influence people's thinking and behaviour	It was necessary to consider both innovative products and approaches in DRR strategies when working to develop them further and make them more effective and useful. CBDRR was still a relatively new approach, even among governments
S13	Health care	This study proposed a conceptual ERM framework specifically designed for health care organisations. The study explored how hospitals in the United States and Brazil structured and implemented ERM processes within their management structures	The study confirmed that adopting ERM for health care organisations had gained momentum and become a priority. The demand for risk economic assessment orientation was common among health care risk managers	Given the complexity of the variables affecting health care organisations in other countries: political, financial, and environmental, the results of this study may not be generalisable
S14	Board of directors	This study explored the role of the board of directors in the relationship between integrated risk management and product innovation. The study focused on the board's direct involvement in risk oversight and its use of external audits in risk oversight. It also examined their moderating effects on the relationship between integrated risk management and product innovation	The finding demonstrated that a board's risk involvement and its use of external audits in risk oversight negatively moderated that relationship. A board's direct involvement in risk oversight negatively moderated the positive relationship between integrated risk management and product innovation success. The use of external audits in risk oversight similarly weakened the relationship	First, this study examined only the relationship between IRM and product innovation. It would perhaps be fruitful to extend the theoretical framework to other innovative activities, such as process innovation or organisational innovation. Furthermore, it would be interesting to break down product innovation into radical and incremental innovations and examine any differences in the relationship with IRM and board involvement. Since the entire sample was from China, future research needs to validate the applicability of these findings elsewhere. Finally, this analysis used time-lagged variables to address this issue

(continued)

Table 4 (continued)

No.	Third term	Purpose	Finding	Limitations
S15	Strategic choices	This study developed a fuzzy evaluation model that provided managers at different responsibility levels in pharmaceutical laboratories with a rich picture of their innovation risk and that of competitors. This situation helped them make better decisions about managing their present and future portfolio of clinical trials in an uncertain environment	The main finding of this work was the development of an innovative fuzzy evaluation model that was useful for analysing the innovation risk characteristics of large pharmaceutical laboratories given their strategic choices	Small pharmaceutical laboratories are a relevant part of the pharmaceutical industry but were not covered in this paper. Other restrictions imposed in this work could be relaxed, allowing each expert to evaluate the model's variables by proposing their independently of the rest of the evaluators
S16	Resistance to change	This paper investigated why different individuals struggled to achieve a shared understanding of innovation projects. The primary focus was on the individuals' functional backgrounds as the cause of systematic differences in assessing innovativeness, neglecting dispositional traits. So the paper investigated how a decision's context and an individual's resistance to change influenced the assessment of an innovation project's risk and innovativeness	The paper showed that an individual's resistance to change moderated the positive relationship between an innovation project's innovativeness and its perceived risk. It also indicated that; department orientation, mental models, or thought worlds caused systematic differences when individuals evaluated innovation projects	First, the experimental design sought to clarify the specific relationship between the constructs, limiting it in terms of complexity. Second, it reduced complexity and neglected to include recent research avenues during innovation portfolio management. Third, recent research has not been able to clarify the influence of innovation project portfolio's innovativeness on agility. Finally, testing the generalisability of the findings with an investigation of practitioner behaviours could offer further novel insights
S17	Logistics management	This study determined the impact of the risk of implementing digital technologies for logistics management	The literature review proved that this issue still had a research gap in management theory, including in logistics. Analysis of the research results showed that the implementation and use of digital technologies implied changes in logistics management. However, this impact was diversified, depending on the digital technology type	The limitations of this study were that the implementation and use of digital technologies implied changes in logistics management. However, this impact was diversified, depending on the digital technology type. Therefore, it could be assumed that not all digital technologies arouse equal interest among logistics specialists, bringing with them the yet unknown effects of the risk of implementing digital technologies

(continued)

Table 4 (continued)

No.	Third term	Purpose	Finding	Limitations
S18	Cloud-based business	This study uncovered the myriad challenges managers confront as they seek to leverage cloud technology in the ongoing transformation of their organisation's service offerings. Combining this systematic literature analysis with relevant theory also helps managers identify their organisation's general risk profile and links that profile to a specific configuration of resolution	This study synthesised an integrated model for managing risk during the innovation of cloud-based business services. The model identified three types of risks (services, technology, and process risks) and four types of resolutions (stakeholder engagement, technology development, innovation planning, and innovation control)	One area for future research is to explore whether the risk-strategy model works differently for public, private, and hybrid cloud environments. The research did not differentiate between these categories; hence, further insights may be gained from investigating the differences and commonalities across these contexts. is how cloud-based business services providers might deal with the risks of transitioning all or some of their services to the cloud
S19	Knowledge management	This study examined the impact of internal and external KM capabilities on BMI and how risk-taking tolerance moderated these effects	The results from this study indicated that external KM capabilities stimulated BMI. This relationship was strengthened for firms with a high risk-taking tolerance. Internal knowledge was only effective for firms with a low risk-taking tolerance	It was important to consider the nature of the data basis for empirical analysis when interpreting the data. The study relied on key informants in each organisation. Multiple informants in each organisation might be preferable to capture different facets of BMI. Although this issue was lower for SMEs, future studies are encouraged to collect data with respondents at different levels in a firm. The study only focused on external and internal KM capabilities from a theoretical perspective
S20	Enterprise management	This paper showed that it was possible to measure the risks that an innovation company faces and that such risks can be managed with the support of a company strategy. An economic analysis was applied based on MCS and an indicator of CFaR to measure innovation risks. A strategic performance model for innovation companies was proposed, and the benefit of implementing risk management practices in innovation organisations was validated	The main findings indicated the link between analysing the risks to which a company was exposed, its origin, and their relationship to decision making to manage the company strategically. In brief, the probabilistic analysis of the risks indicated the variables that caused the greatest financial impact	The region limited this research. The case study was from Brazil and cannot be assumed as a global conclusion. Similarly, by only examining one case, the findings were specific to one company and its business sector

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Table 4 (continued)

No.	Third term	Purpose	Finding	Limitations
S21	Project management	This paper helped fill the knowledge gap based on a practical basis for designing the most appropriate form of risk management in different innovation-based industries. It also highlighted the possibilities for better integration of the theories of innovation and project risk management	The main finding of this paper was to provide a framework that diverse companies could appreciate. The framework offers a basis for discussing the most appropriate form of risk management in different innovation-based industries	It would be useful to extend this research by examining more case studies from other countries and industries
S22	Management control systems	This study used the concept of institutional leadership to explore how leaders balanced creativity and product innovation against administrative arrangements, such as risk management and management control	Using two case companies, distinct contrasts to this balance were produced. Neither showed the ambidexterity needed to 'secure the value of innovation and exploration and developed risk management and control systems for exploitative activities	A limitation of this study was that both enterprises were highly focused on engineering and dominated by engineers
S23	Project management	This research identified the sources of risk in innovation projects and determined whether they could be managed better	This research attempted to provide a system for managing the risk in innovation projects. It also created a method for prioritising different risks factors and managing the most important ones in the second stage of this risk management system for innovation	The proposed method for analysing the risk in risk the management system will be applied for one case
S24	Crowdfunding	This paper filled the research gap of understanding the innovation and risk balance strategy for new product development (NPD) at small companies. It also explored innovation versus risk for small companies using crowdfunding products as a proxy for analysis	The main result suggested a preliminary innovation and risk balance framework for crowdfunding NPD success. A statistical model was developed to correlate the amount of crowdfunding raised with 64% predictability. These results may contribute to better understanding and balancing risk and innovation in crowdfunding and small company contexts	The limitations are worth mentioning. The adapted RWW metric might require further refinement before being applied to a wider selection of products and crowdfunding platforms. Also, the current rating process was relatively slow to generate a large dataset for analysis. The results from this paper could be used to generate experience to design better machine learning tools for a faster and more rigorous data collection and analysis. Finally, the implications from this paper were constrained to the context of crowdfunding. Caution shall be taken before interpreting the results for other areas

(continued)

Table 4 (continued)

No.	Third term	Purpose	Finding	Limitations
S25	Risk conception	This paper explored the risk conceptions of innovators in two large corporations and identified three themes that illuminated the relationship between risk and innovation in the corporate setting	There were three main findings. The first related risk to the issues of boundaries and control over parts of the innovation process. The second showed how risk was primarily related to innovation as a process and not an output. The third showed how a flexible view of business models could manage risk in corporate innovation	The two units came from different industries and differed in corporate history and performed work. Second, there was a tendency to discuss both innovation risks and the concept of quality about processes instead of outputs. Finally, given the small sample size, the results were not generalisable in a statistical sense
S26	Learning	The study investigated a subset of management practices that might have contributed to the success of radical innovation efforts by large established firms. The study focused on that subset of practices concerned with learning-oriented approaches to risk management	The study found that the development of dynamic capabilities for managing highly uncertain phenomena, such as radical innovation, included a risk management-by learning capability. Further research is necessary to replicate the findings and extend them to other high uncertainty venues	The limitations were that the interaction between industry clock speed and harvesting strategy negatively affected activity and output, suggesting that a strategy of harvesting early and often was more valuable for firms operating in less dynamic environments. Thus, the interaction between the use of experimental processes and industry clock speed did not significantly correlate with any of the RI success measures
S27	Public procurement	This study provided the public sector with what was necessary to deal with different kinds of process risks. The study took an exploratory approach in determining the state of practice regarding risk management in public procurement for innovation at the local level	The study found that cities were, for the most part, actively engaged in risk identification; the risks were being met mainly with mixed solutions in contracting strategies rather than comprehensive risk-management tools	There were no signs of addressing these risks via comprehensive risk management strategies aimed at reducing providers' technology or innovation-related risks. Further studies are needed to document how the public sector meets the risks when using public procurement to promote innovation. Also, further research is needed for building coherent theoretical models addressing this issue

Table 5 Independent and dependents factors

No.	Independent factors	Dependent factors
1	• Innovation output • Innovation input • Source of innovation • Innovation strategy • Technology • External orientation	• Innovation • Risk management
2	• Environmental turbulence • Adoptive innovator behaviour • Appetite for risk-taking • Innovation performance	• Innovation • Risk management
3	• Supply chain innovation (SCI) • Robustness capability (RB) • Resilience capability (RS) • Competitive advantage (CA)	• Innovation • Risk management
4	• Leadership in a Leadership Configuration (LLC) • Management in a Leadership Configuration (MLC) • Leading in a Management Configuration (LMC) • Managing in a Management Configuration (MMC)	• Innovation • Risk Management
5	• Risk Management Effectiveness (RME) • Investment in Innovation (II) • Financial Leverage (FL) • Performance (PER)	• Innovation • Risk management
6	• Partner's intensity of competition • Partner's time-to-market • Innovation degree • Partner's assumed level of risk • Partner's allowed cost reduction • Partner' delivered learning opportunities • Strategic importance of resources accessed through the partner	• Innovation • Risk management
7	• Individual education • Communicative influence • Advise/Consult • Co-govern • Direct authority • Technical expertise • Deliberate and negotiate • Aggregate and bargain • Develop performance • Express performance • Explicate data collection • Listen as a spectator • Implicate data collection	• Innovation • Risk management

(continued)

Table 5 (continued)

No.	Independent factors	Dependent factors
8	• INN PRO • AGE • PUB • Fam CEO • CEO AGE • EMPL • FTMT • DEM HETER • HIGH QUALITY	• Innovation • Risk management
9	• Patient engagement • Caregiver involvement • Expectation management • Care coordination • Sociocultural awareness	• Innovation • Risk management
10	• Risk-taking	• Innovation • Risk management
11	• Suitability • Best practices • Business performance • Organisational change	• Innovation • Risk management
12	• Networking • Coproduction of knowledge • Academia	• Innovation • Risk management
13	• Process and Strategy • Risk culture and education • Risk Identification • The Action plan and KPI's	• Innovation • Risk management
14	• Constant • R&D expenditure • Foreign • Domestic • Firm size • Sales • Industry dummy	• Innovation • Risk management
15	• Avg sales • Avg dept • Constant • R-squared • No observation	• Innovation • Risk management
16	• Resistance to change • Perceived Innovation • Market-related facets • Technology related facets • Perceived risk	• Innovation • Risk management

(continued)

Table 5 (continued)

No.	Independent factors	Dependent factors
17	• Three-dimensional printing • Artificial intelligence • Blockchain • Drones • Augmented reality • Self-propelled vehicles	• Innovation • Risk management
18	• Stakeholder engagement • Technology development • Innovation planning • Innovation control	• Innovation • Risk management
19	• Internal KM capabilities • External knowledge management capabilities • Organisational risk-taking tolerance	• Innovation • Risk management
20	• Physical change in space • Delivery date products and equipment • Important delay • Dibbing • Quality of workmanship • Technology changes • Use • Process management	• Innovation • Risk management
21	• Customer feedback • Employees' opinion • Competitors • Market • Profit • Internal control	• Innovation • Risk management
22	• Organisational • Products • Strategic	• Innovation • Risk management
23	• Learning • Creativity • Selection • Incubation • Implementation	• Innovation • Risk management
24	• Voice of customer • Functional feasibility • Tangible and intangible benefits • Vulnerability risk evaluation and growth strategy	• Innovation • Risk management

(continued)

Table 5 (continued)

No.	Independent factors	Dependent factors
25	• Quality assurances • Customer relations management • Relations to partners • Dated support systems • Organisational efficiency • Customer contracts • Human capital risk • Business culture • Development	• Innovation • Risk management
26	• Options thinking • Experimental processes • Harvest strategy	• Innovation • Risk management
27	• Nature of innovation • Procurer's level of risk • Risks identified by cities • Risk management tools applied by cities • Deviation from regular tendering procedures • Technology standards • Performance agreements • In-depth market study	• Innovation • Risk management

Articles from China:

There were five articles from China. The first article highlighted the research's purpose to mediate the role of decision quality in the relationship between risk management and firm performance (Tidd & Hull, 2006) The second article examined the impact of risk management strategies on high technology firms in China (Yang, 2008). While Zheng et al. (2010) conducted his study by examining the mediation role on risk management and organization Innovation culture, structure, strategy, and effectiveness. The fourth article asserted the relationship between risk management orientation, organisation innovation, and organisational performance (Darroch, 2005). The last article from China focused on the fit between risk management strategies and intellectual capital and their impacts on firm performance (Hsu & Sabherwal, 2012) .

Articles from Spain:

In this study, three articles from Spain were covered. The first article showed a model of strategic human resource practices as a catalytic mechanism influencing the effectiveness of risk management (Inkinen et al., 2015). The second paper aimed to evaluate structural and relational capital's roles as the conclusions of codification and personalisation of risk management strategies in renewal capital and innovation in low- and high-tech companies (Buenechea-Elberdin et al., 2018) . The third article showed the relationship between SMEs' R&D internationalisation and innovation outcomes (Ren et al., 2015). Edwards et al. (2005) defined his research paper

Table 6 Frequency variables according to the databases

No.	Databases	Culture	Structure	Strategy	Technology	Intellectual capital	Leadership
1	ProQuest	7	6	4	5	2	2
2	Emerald	2		2	6	2	2
3	Science Direct	1	1	2	1	1	1
4	Tylor & Francis						
5	Google Scholar	1		1		1	
Total		**11**	**7**	**9**	**12**	**6**	**5**
1	2015	X			X		X
2	2017					X	
3	2018		X	X			
4	2017	X		X	X	X	
5	2011			X			
6	2010				X		
7	2013	X	X				X
8	2016				X	X	
9	2014	X		X			
10	2019			X			
11	2014	X	X	X			
12	2015				X		
13	2019	X					
14	2017		X				
15	2017	X		X	X		
16	2013						X
17	2018				X	X	
18	2019	X	X		X		X
19	2015			X			
20	2019						
21	2019				X	X	
22	2015	X	X				
23	2016				X		
24	2019				X	X	
25	2015	X	X				X
26	2010			X	X		
27	**2013**						
Total	**11**	**7**	**9**	**12**	**6**	**5**	

Table 7 Checklist for quality assessment

#	Question
1	Were the research aims specified clearly?
2	Did the study design achieve these aims?
3	Were the variables considered in the study specified clearly?
4	Was the study context/discipline specified clearly?
5	Were the data collection methods detailed adequately?
6	Did the study explain the validity/reliability of the measures?
7	Were the statistical techniques used to analyse the data described adequately?
8	Did the results add to the literature?
9	Did the study add to your understanding or knowledge?

by assessing the impact of risk management RM strategies on a firm's corporate performance and innovation.

Articles from India:

Three articles from India were covered. The first article evaluated organisational learning, firm performance, and risk management (Fort-Rioche & Ackermann, 2013) The second article proposed a conceptual model comprising six knowledge management and two performance constructs (Joshi & Chawla, 2019). Narvekar and Jain (2006) studied the influence of efficient risk management practices on firm performance.

Articles from Iran:

There were four articles from Iran. The first one evaluated risk management value and organisational innovation (Salaman & Storey, 2005). Wehn and Evers (2015) defined his research to determine relationships between; organisational learning, transformational leadership, organisational innovation, knowledge management, and organisational performance. The third article studied the influence of organisational innovation and risk management practices in SMEs using structural equation modelling SEM (Calvo-Mora et al., 2016). The last study presented a universal approach to evaluating RM practices on FP (Douthwaite & Ward, 2005).

Articles from Taiwan and Japan:

Gurd and Helliar (2017) examined the relationship between RM strategy and FP performance. While Tseng and Lee (2014) showed how enterprises could effectively apply their risk management capabilities and develop uniquely dynamic capabilities. The article from Japan assessed explicit and implicit risk's role in translating management innovation into firm performance in Japanese companies (Van de Ven, 1986).

Table 8 Quality assessment results

Study	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Total	Percentage (%)
S1	1	1	1	1	1	0.5	1	1	1	8.50	94
S2	1	1	1	1	1	0.5	1	0	1	7.50	83
S3	1	0.5	1	1	0.5	0.5	0	0	1	5.50	61
S4	1	1	1	1	1	0.5	1	0	0.5	7.00	78
S5	1	1	1	1	1	1	1	0	1	8.00	89
S6	1	1	1	1	0	0.5	0	0	0.5	5.00	56
S7	1	0.5	1	0.5	0.5	0.5	0	1	0.5	5.50	61
S8	1	1	1	1	1	1	1	0.5	1	8.50	94
S9	1	1	1	1	1	1	1	0.5	0.5	8.00	89
S10	1	1	1	1	1	1	1	0	0.5	7.50	83
S11	1	1	1	1	1	1	0.5	1	0.5	8.00	89
S12	1	1	1	1	1	1	1	0.5	0.5	8.00	89
S13	1	0.5	1	1	0.5	1	1	0.5	0.5	7.00	78
S14	1	0.5	1	0.5	1	1	1	0.5	1	7.50	83
S15	1	1	1	1	1	1	1	0.5	0.5	8.00	89
S16	1	0.5	1	1	1	1	1	0	0	6.50	72
S17	1	0.5	1	1	1	1	1	0.5	0.5	7.50	83
S18	1	1	1	1	1	1	1	1	1	9.00	100
S19	1	1	1	1	1	1	1	0.5	0.5	8.00	89
S20	1	1	0.5	0.5	0.5	1	1	1	1	7.50	83
S21	1	1	1	1	0.5	1	1	0.5	0.5	7.50	83
S22	1	0.5	1	1	1	1	1	0.5	0.5	7.50	83
S23	1	1	0.5	1	1	1	1	0	0.5	7.00	78
S24	1	1	1	1	1	0	1	0.5	0.5	7.00	78
S25	1	1	1	1	1	1	1	0.5	0.5	8.00	89
S26	1	1	1	1	1	1	1	1	1	9.00	100
S27	1	1	1	1	1	1	1	1	1	9.00	100

Articles from the US and Brazil:

Bowers and Khorakian (2014) in his research tested the relationship between strategic intent, including; the goals, vision and mission of intellectual capital (i.e., structural capital, relational capital, human capital), risk management, and. While Vargas-Hernandez and Garcia-Santillan (2011) reviewed a conceptual view of the relationship between; business innovation and risk management, supply chain technology investments, and overall firm performance. The author from Brazil classified the type and intensity of relationships between; organisational performance, innovation performance, and strategic knowledge management (SKM) practices (Afuah, 2003).

Articles from Bahrain and Egypt:

The Bahraini article evaluated a comprehensive model comprising various relationships between; risk management (RM) processes, transformational and transactional leadership, and organisational performance (Birasnav, 2014). While Jin and Navare (2010) from Egypt, in his study, highlighted the role of risk management to enhance organisational performance and, consequently, developed an integrated risk management capabilities framework for assessing organisational innovation.

Articles from Malaysia and Indonesia:

Three articles were from Malaysia, where the first author examined the indirect relationships between Soft TQM factors and risk management with firm performance (Etges et al., 2017). The second author evaluated the relationship between organisation performance and risk management capabilities (Berglund, 2007). The last author highlighted the critical role of the risk creation process in demonstrating the risk management enabler's T-shaped skill to create creativity in the organisation, which wand, thus, firm performance (Azmi et al., 2018). There were two articles from Indonesia. The first investigated the environmental hostility contingencies on the relationship between firm innovation and risk management strategy (Ambad & Wahab, 2013). The second article, Hock-Doepgen et al. (2021), studied the application of risk management and intellectual capital as variables and tested their effect on firm performance.

Articles from Finland, the UK, Italy, Slovenia, and Serbia:

The author from Finland covered the relationship between risk management and intellectual capital and firm performance (Hock-Doepgen et al., 2021). While Hölttä-Otto et al. (2015) researched to show the effect of the company performance on risk management with information technology support. The author from Italy assessed the link between; problem-solving processes, knowledge management practices, and organisational innovation (Giampaoli et al., 2017). The Slovenian article showed that through; creating, collecting, organising, and utilising knowledge, that organisations could enhance organisational performance (Rasula et al., 2012). The article from Serbia focused on the effect of risk management on organisational performance and innovation in Serbia's economy (Dwyer et al., 2016).

RQ2: Distribution of research methods

Regarding the study distribution by research method used, the chart below shows that numerous research papers depended on the case study approach in their studies as it was the most prevalent method for collecting data. Several other studies used interview methods. The framework, quantitative and qualitative, literature review, mail survey, and conceptual study methods were also used in the examined studies (Fig. 2).

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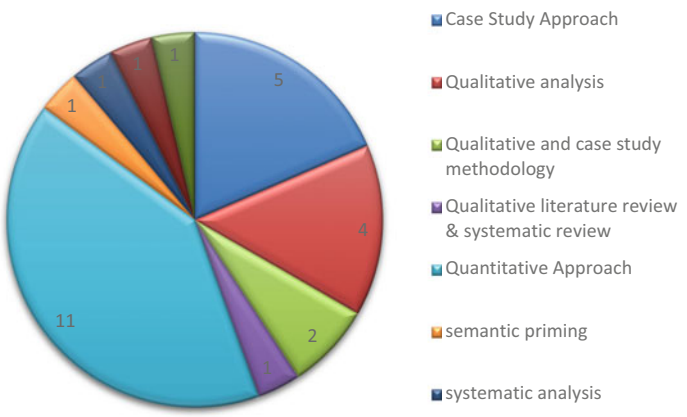


Fig. 2 Study distribution by research method

RQ3: Country distribution of research studies

The chart below shows that the USA produced the most research articles concerning risk management and innovation in the examined studies. This situation may be because the USA is a leading industrial country globally. Brazil ranked in second place with three articles. The UK, Germany, Sweden, and Australia were ranked third with two articles. The rest of the countries each had one article, as shown in Fig. 3.

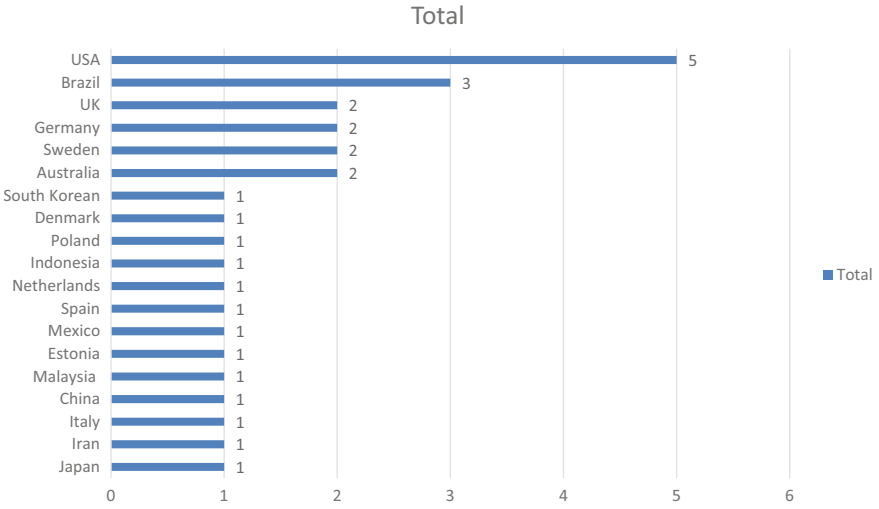


Fig. 3 Number of research studies by country

RQ4: Distribution of research context

This systematic review covered many contexts: investment, large firms, academia, government, NGOs, the private sector, different manufacturing industries, hospitals, innovation projects, high technology firms, electronic and electric firms, hospitality services, domestic companies, and manufacturing organisations. Firms, SMEs, technology and IT cross-sectional industries, textile industries, family businesses, PLU-SMEs, engineering firms, and firms adopted the risk management system. The chart below illustrates that large firms were ranked highest with eight articles, small-medium enterprises had three articles, and manufacturing firms came next in the context of this research. Technology and IT firms came after innovation projects (Fig. 4).

RQ5: Distribution of studies by year of publication

Listed by the year of publication, Fig. 5 presents the distribution of the examined studies investigating risk management and innovation from 2007 to 2020. The number of research papers covered in this research totalled 27. It can be seen that there was one article in 2008, 2009, 2011, 2013, 2014, and 2016, respectively. There were two articles in 2007, 2010, and 2018. There were three articles in 2015 and four articles in 2017. In 2019 the number of articles totalled eight.

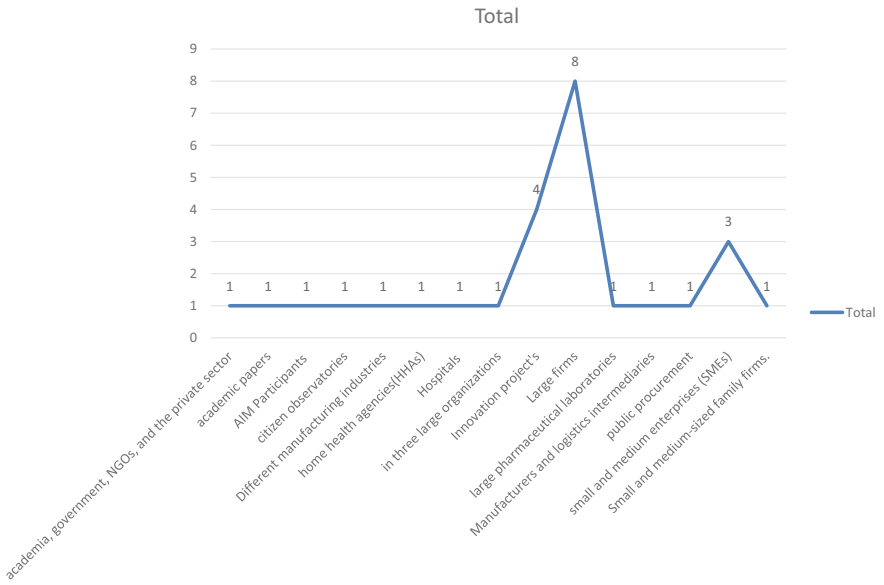


Fig. 4 Distribution of studies by context/discipline

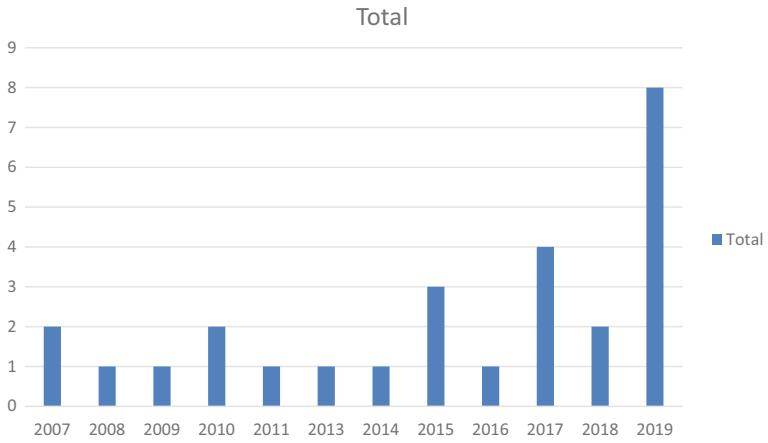


Fig. 5 Number of articles by year

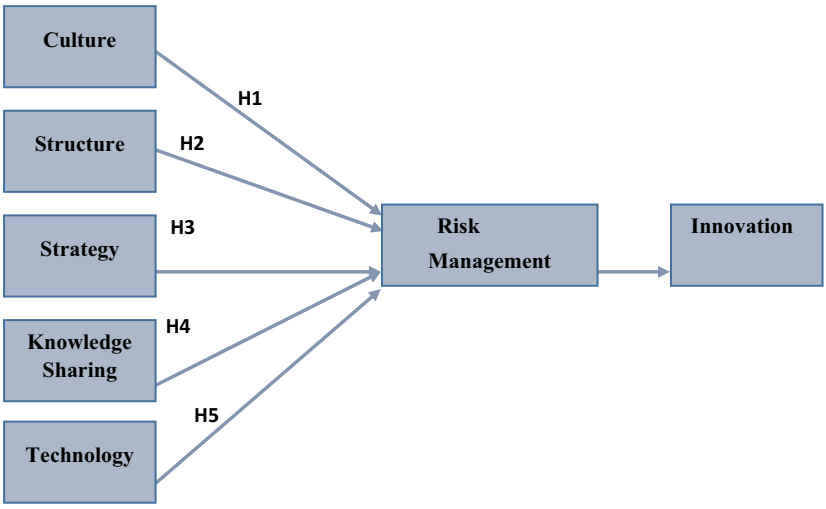
4 Discussion

The primary goal of this study was to systematically review and synthesise the existing published studies concerning risk management and diffusion of innovation. Organisation learning, teamwork and collaboration, performance management, freedom and autonomy, recognition and reward, and achievement orientation were positive predictors of the different dimensions of innovation and RM practices. Firms characterised by high levels of intellectual capital and the high-level implementation of RM practices are more likely to overtake the firms with low overall levels of intellectual capital and RM practices. There was support for the complementarity viewpoint by showing that codification and human capital RM capabilities interacted to influence customer service outcomes (Da Silva Etges et al., 2018; Games & Rendi, 2019; Koru et al., 2018). The research studies concerning risk management and innovation highlighted the need to study the technological sections of firms as a contingency variable affecting the intellectual capital and innovation relationship. Koru et al. (2018) research highlighted the importance of setting a risk management strategy before anything else. Most of the articles indicated that management and innovation were positively related. Many mediators were mentioned that affected the relationship between RM and DOINV, such as; human resources, knowledge, potential, trust, rewarding policy, corporate culture, structure and strategy.

Figure 2 shows the study distribution by research method. The results show that 41% of the studies used case studies for their data collection. This outcome reflected that quantitative research was more common research than qualitative research. According to Figure 3, most of the examined studies came from the USA, comprising 12% of the research articles, as the USA is one of the leading manufacturing countries. Brazil came second with 9.7% of the research articles. Figure 5 shows the research studies in terms of the context. 14 % of the research articles were from the

context of large firms, 9.7% from manufacturing firms, 7.2% from SMEs, and 2.4% from IT and technology firms. Figure 5 illustrates the year of publication.

After checking the dependent and independent factors, it could be seen that the most frequent factors were (culture, structure, technology, intellectual capital, and leadership)**.** This comprehensive research highlights paths for future studies concerning the internal drivers that affect risk management and diffusion of innovation. The research model is shown below: culture, structure, strategy, knowledge sharing, and technology were used as internal factors that affect risk management and diffusion of innovation. The model shown below was drawn based on the hypotheses of the paper (Fig. 6).



H1: Culture positively impacts risk management

H2: Organisation structure negatively impacts risk management

H3: Great organisation strategy positively impacts risk management

H4: Knowledge sharing positivel impacts risk management

H5:A higher degree of technology has a positive impact on risk management.

H6: Risk management has a positive impact on firm performance

H7: Risk management mediates the relationship between culture and organisation performance

Fig. 6 Research model

5 Conclusion

Many findings can be drawn from this systematic review concerning risk management and diffusion of innovation. In this research, several factors reoccurred, such as; culture, structure, strategy, technology, intellectual capital, leadership, process, and rewards. The majority of the repeated elements were located within firms and organisations. This outcome will lead any future studies regarding the internal drivers affecting RM and DOINV. Secondly, the majority of the articles indicated a positive relationship between risk management and diffusion of innovation. An increasing relationship between RM and DOINV was discovered. Thus, if a firm possesses excellent risk management, there will also be high diffusion of innovation. Thirdly, the primary data collection method in most examined research was through surveys; around 78% of the examined works used surveys. Fourthly, positive research outcomes were found in 87.8% of the articles, 7.9% had negative outcomes, and 4.3% were N/A.

There were several limitations related to this systematic review. First, numerous articles highlighted limitations in their conceptual and theoretical models, which required additional constructs. Second, many articles examined specific countries and contexts, making it difficult to generalise the studies. The third limitation was small sample sizes, which indicated low reliability in many examined articles. The fourth limitation was that some studies have not considered other possible moderators and mediators, such as; trust, policy, rewards, etc. Finally, bias was indicated in many articles.

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Corporate Governance and Performance

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The Impact of the Quality of Medical Information Systems on Job Performance in Private Hospitals in Jordan

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Abstract The study aims to identify the impact the quality of medical information systems on the job performance in Private Hospitals in Jordan. The study population consisted of all employees with job titles (doctor, nurse, pharmacist, laboratory technician) in private hospitals in Jordan. Data were primarily gathered through self-reported questionnaires creating by Google Forms which were distributed to a purposive sample via email. A self-reported questionnaire that consists of two main sections along with a section regarding control variables was used as the measurement instrument. Statistical program AMOSv24 was used to test the study hypotheses. The results showed that the highest impact was for ease of use, followed by ease of learning, then flexibility, then reliability, and finally the lowest impact was for responsiveness. Based on the results of the study, researchers recommend managers

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_45

and decision-makers in private hospitals in Jordan to hold training courses in the field of using medical information systems for all employees in private hospitals, and to focus on maintaining these courses, and raising their levels in line with continuous technological developments and changes.

Keywords Quality · Medical information systems · Job performance Private Hospitals · Jordan

1 Introduction

The phenomenon of globalization has emerged, which has entered the pyramid of the new world system, which calls for a shift from the local market to the global market, and from the concept of time to the concept of synchronization, where the person in his place has become running his business and marketing his product in another place (Aldaihani & Ali, 2018; Allahow et al., 2018; Mohammad et al., 2013). Hence, commercial markets and administrative work have shifted from multiple markets to a single market, and from the unified management to the system of multiple advanced technological managements that work as one body to carry out the knowledge and cultural exchange of information under an important concept (business), this concept plays a major role in the success of any project whatsoever (Al-Hawary & Hadad, 2016; Al-Hawary et al., 2010).

The business system faces many challenges, problems and obstacles that forced it to have a clear strategic approach in light of its managerial work towards achieving its desired goals and interests, and then ensuring that this approach remains safe and away from the complexity, entanglement and challenges (Aldaihani et al., 2020; Al-Hawary & Al-Hamwan, 2017; Al-Hawary & Ismael, 2010). Hence, information systems have an important role, as this system represents (the heart in relation to the body) if it is disturbed, the whole body is disturbed, and if it is safe, it helps in the success of the managerial system (Altamony et al., 2012; Alzoubi et al., 2021a, 2021b; Svoboda et al., 2021).

Modern organizations focus their efforts to continuously improve the level of their performance and the performance of their employees and allocate a lot of their budgets to find ways to raise performance and achieve high levels of productivity (Alshura et al., 2016). The concept of performance is related to the behavior of the

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individual and the organization, and it occupies a special place within any organization as the final product of the outcome of all its activities (Al-Hawary & Shdefat, 2016; Al-Lozi et al., 2017; Al-Lozi et al., 2018). Human behavior is the determinant of job performance, which is the outcome of the interaction between the nature of the individual, his upbringing and the situation in which he is located, and performance does not appear as a result of forces or pressures stemming from within the individual himself, but as a result of the process of interaction and compatibility between the internal forces of the individual and the external forces surrounding him (Al-Nady et al., 2013; Altarifi et al., 2015; Al-Hawary & Mohammed, 2017; Alshurideh et al., 2022).

Information systems and cognitive technology have developed in recent times, and it has become necessary to have a contemporary and advanced medical information system to compete with the challenges and problems it faces (Alhalalmeh et al., 2020; Al-Hawary & AlDafiri, 2017; Aldaihani & Ali, 2018; Aldaihani et al., 2020; Ghazal et al., 2021). Hence the importance of this research by providing a broad understanding of the issue of the quality of health information systems, as the quality of information systems has become evolving and has practical importance in business management; the health information system is a central force to achieve the desired goal of work (Aburayya et al., 2020b, c; Al-Maroof et al., 2021). Thus, this study comes to fill the literary gap in this field, and the concept of employee performance and its implications on the performance of the organization and the performance of the economy as a whole, which increased the importance of this study, so this study came to clarify the impact of the quality of information systems on the job performance in private hospitals.

2 Theoretical Framework and Hypotheses Development

2.1 Medical Information Systems

The information and communications revolution and its advanced and renewable applications in the third decade of the third millennium, of the twenty-first century, brought about a managerial reality different from what it was in previous decades, and the manifestations of the new reality are manifested in the decline of many intellectual concepts and systems on which previous managerial studies relied, which making modern administrative methods almost irrelevant to the reality of managerial thought and its applications in the past decades (Aldaihani & Ali, 2018; Aldaihani et al., 2020; Taryam et al., 2020).

The information revolution is the tool of globalization for the new global system. These technologies are undergoing radical and profound transformations that have increased the speed of the communication process, so that technical obstacles, political considerations and geographical boundaries are no longer an obstacle to the

developmental tide of this service (Al-Lozi et al., 2018; Aburayya et al., 2020a; Al-Hawary & Al-Syasneh, 2020). The information revolution, with its enormous power and ability, has become the main nerve for all possible changes in various aspects of life in this era (Al- Quran et al., 2020). Information systems are considered one of the most important requirements of this era in all its fields, and its various theoretical and practical aspects, and at all levels and activities related to the performance of organizations, and a major resource of the organization and an important source of its success (Ahmed et al., 2020; Alshurideh, 2022; Tariq et al., 2022).

The rapid development in the medical field and medical services in recent decades has increased the demand for appropriate medical information to make medical and managerial decisions, as health managers and policy-makers need appropriate and accurate information to measure the program's effectiveness and follow-up progress to achieve the desired goals, so the investment in medical information systems will be justified because it helps in improving performance and making decisions regarding the detection and control of medical problems (Abu Qaaud et al., 2011; Al-Hawary & Al-Namlan, 2018; Alolayyan et al., 2018; Mohammad et al., 2014, 2020).

The World Health Organization defines medical information systems as "integrated efforts to collect and process medical data and transform it into information and knowledge for use in decision-making and policy implementation at all levels of medical services to improve its efficiency and effectiveness". Lippeveld (2000) Defined medical information systems as "a set of elements, components and procedures for an organization that aims to obtain information" that supports managerial and medical decisions at all levels of the medical system. Medical information systems are defined as "a group of special computer systems, which are used to provide medical information" Patients and auditors in particular, and the hospital in general, regards to a set of functions that enable investors to enter, maintain and review information, and issue statistics and reports that help in making medical, therapeutic and managerial decisions.

The joint commission on accreditation of hospitals (JCAH) defines it as the degree of adherence to generally recognized contemporary standards of good practice and expected outcomes for a specific service, diagnosis, or medical problem. Good medical services are those that follow the standards and foundations that were followed and taught by the founding leaders of the medical profession in society. Quality of medical care may be defined; as an accessible, safe, responsible and fair medical care. This means that the service provider provides the right care for the right condition at the right time in the right way. Patients easily get care at the right time in an accurate manner, and they have to have full information about the risks in order to avoid unsafe procedures and full information about the benefits of the care they receive, respect the rights of both patients and providers (Al-Hawary & Abu-Laimon, 2013; Al-Hawary et al., 2011). The quality of the medical service is measured by the availability of the five dimensions that Berry et al. reached in the medical service provided by the hospital, and these dimensions are:

Quality of medical information systems are those systems that aim to provide medical information for patients, auditors and the hospital itself, which helps to

make, develop and improve the level of effective medical, treatment and managerial decisions. The quality of medical information systems is the systems with good and specific specifications and characteristics, easy to use and at a high level of accuracy. Good medical information systems are the systems that are able to raise the level of the organization's performance and achieve its goals with the least effort and time (Al-Hawary, 2012; Alzoubi et al., 2020; Zu'bi et al., 2012).

Ease of use: The ability of systems to be used easily in order to achieve a specific goal, and usability also means how efficient those systems, clarity in design, and human interaction with them (Al-Hawary & Al-Smeran, 2017; Alshurideh et al., 2020).

Response time: The time it takes for a system or functional unit to respond to a specific input or is the total time it takes to respond to a service request, which is the sum of the service time and waiting time, which is the time it takes to do the work you requested.

Flexibility: It expresses the extent to which the systems are able and responsive to changes, or it is the ability of the system to absorb disturbances, reorganize, and continue to perform functions with the same efficiency as before.

Ease of learning: The extent to which systems are able to understand, use, deal with, and use them in the correct ways (Al-Hawary & Hussien, 2017).

Reliability: The ability of the systems to perform the required tasks (completely free from technical errors); It is a measure of the period during which the systems can perform their agreed function without interruption. The term reliability can also be used to indicate the extent to which a particular process or function is likely to achieve the outputs required (Al-Hawary & Metabis, 2012).

2.2 Job Performance

There is an increasing interest in the issue of job performance, and the effectiveness and efficiency of organizations in carrying out their functions and achieving the goals for which they were established, whether these are profit or service organizations (AlShehhi et al., 2020; Alsuwaidi et al., 2020). Hence the focus on human resources management and the exploitation of available opportunities and available energies, in order to provide services quickly and with high quality, so that organizations can respond to the needs and expectations of customers, in a way that guarantees them reaching their goals by raising the level of performance to ensure their continuity, growth and development (Zwick, 2006; AlHamad et al., 2022; Shamout et al., 2022).

Job performance is the main axis around which the efforts of organizations focus as it constitutes their most important goals. Organizations expect human resources to perform the functions assigned to them efficiently and effectively. Performance refers to the degree of achievement and completion of the tasks that constitute the job of

the working individual, and it reflects how the individual achieves the requirements of the job, and often there is confusion and overlap between performance and effort, effort refers to the energy expended, while performance is measured on the basis of the results achieved by the individual (Al-Nady et al., 2013; Mohammad, 2020; Al Kurdi et al., 2020). Huang et al. (2015) defines job performance as the achievements of an organization through the goals set and includes the outputs that are achieved or achieved through the contribution of individuals or the team in achieving the strategic goals of the organization.

Willcocks and Smith (1995) defined Job performance as "a continuous process of defining, measuring and developing performance in an organization by linking each individual's job performance and goals with the organization's tasks and objectives in full." We believe that performance is the levels of business achievement, which expresses the extent to which individuals or organizations carry out their responsibilities and tasks using the available capabilities and resources in the best possible way. In other words, it is the outputs and goals that the organization seeks to achieve through its employees, and therefore it is a concept that reflects both the goals and the means necessary to achieve them, that is, it is a concept that links the aspects of activity and the goals that organizations seek to achieve through the tasks and duties performed by the workers in those organizations. They are embodied in the form of useful products and services.

2.3 Medical Information Systems and Job Performance

Al-Gharabawi study (2014) found a positive relationship between computerized health information systems and job performance in UNRWA health centers in the Gaza Strip. Abugabah et al. found an impact of computerized information systems on user performance depends on 4 influencing factors: system quality, information quality, technological components, and human characteristics. This study presented most of the previous evaluation models with an explanation of the similarities and differences between them and the model under development, where the researchers considered that there is a need to develop this model to be a comprehensive model that facilitates the process of understanding the impact of the use of information systems on user performance. Based on the above, the hypothesis of the study can be formulated. as follows:

There is a statistically significant effect of the quality of health information systems on job performance in private hospitals in Jordan.

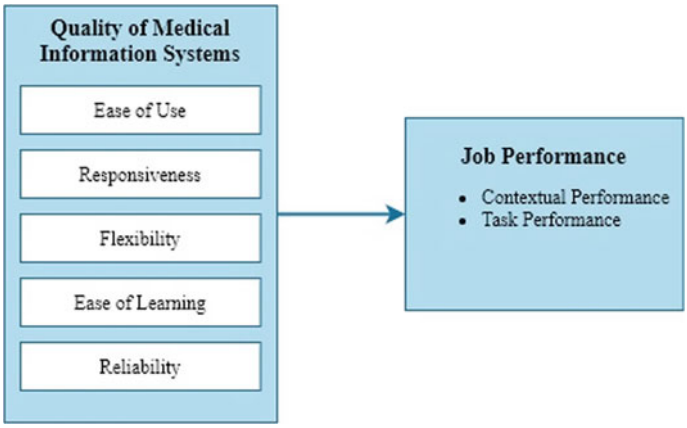

Fig. 1 Conceptual model

3 Study Model

See Fig. 1.

4 Methodology

4.1 Population and Sample Selection

A qualitative method based on a questionnaire was used in this study for data collection and sample selection. The major aim of the study was to examine the impact of quality of medical systems on job performance. The study population consisted of all employees with job titles (doctor, nurse, pharmacist, laboratory technician) in private hospitals in Jordan. Data were primarily gathered through self-reported questionnaires creating by Google Forms which were distributed to a purposive sample via email. In total, (205) responses were received including (14) invalid to statistical analysis due to uncompleted or inaccurate. Hence, the final sample contained (191) responses suitable to analysis requirements, where it proved to be sufficient to the extent that was predictable and allowed for a presumption of data saturation (Sekaran & Bougie, 2016).

4.2 Measurement Instrument

A self-reported questionnaire that consists of two main sections along with a section regarding control variables was used as the measurement instrument. Control variables considered as categorical measures were composed of gender, age group, educational level, and experience. The two main sections were dealt with a five-point Likert scale (from 1 = strongly disagree to 5 = strongly agree). The first section contained (23) items to measure quality of medical systems based on (Alshurideh et al., 2017). These questions were distributed into dimensions as follows: five items dedicated for measuring ease of use, four items dedicated for measuring responsiveness, five items dedicated for measuring flexibility, five items for ease of learning, and four items dedicated for measuring reliability. Whereas the second section included eight items developed to measure job performance according to what was pointed by (Al-Hawary & Metabis, 2012).

5 Findings

5.1 Measurement Model Evaluation

This study was conducted structural equation modeling (SEM) to test hypotheses, which represents a contemporary statistical technique for testing and estimating the relationship between factors and variables (Wang & Rhemtulla, 2021). Accordingly, the reliability and validity of the constructs were tested using confirmatory factor analysis (CFA) through the statistical program AMOSv24. Table 1 summarizes the results of convergent and discriminant validity, as well the indicators of reliability.

Table 1 shows that the standard loading values for the individual items were within the domain (0.615–0.866), these values greater than the minimum retention of the elements based on their standard loads (Al-Lozi et al., 2018; Sung et al., 2019). Average variance extracted (AVE) is a summary indicator of the convergent validity of constructs that must be above 0.50 (Howard, 2018). The results indicate that the AVE values were greater than 0.50 for all constructs, thus the used measurement model has an appropriate convergent validity. Rimkeviciene et al. (2017) suggested the comparison approach as a way to deal with discriminant validity assessment in covariance-based SEM. This approach is based on comparing the values of maximum shared variance (MSV) with the values of AVE, as well as comparing the values of square root of AVE ($\sqrt{}$AVE) with the correlation between the rest of the structures. The results show that the values of MSV were smaller than the values of AVE, and that the values of $\sqrt{}$AVE were higher than the correlation values among the rest of the constructs. Therefore, the measurement model used is characterized by discriminative validity. The internal consistency measured through Cronbach's Alpha coefficient (α) and compound reliability by McDonald's Omega coefficient (ω) was conducted as indicators to evaluate measurement model. The results listed

Table 1 Results of validity and reliability tests

Constructs	1	2	3	4	5	6	7
1. EU	**0.758**						
2. RP	0.497	**0.725**					
3. FL	0.533	0.538	**0.741**				
4. EL	0.567	0.477	0.443	**0.755**			
5. RL	0.482	0.509	0.581	0.592	**0.765**		
6. CP	0.711	0.694	0.722	0.693	0.708	**0.737**	
7. TP	0.702	0.715	0.712	0.699	0.695	0.645	**0.753**
VIF	2.384	1.885	2.642	2.539	1.286	–	–
Loadings range	0.615–0.866	0.692–0.758	0.653–0.791	0.681–0.806	0.724–0.813	0.652–0.816	0.705–0.824
AVE	0.575	0.526	0.549	0.571	0.585	0.543	0.566
MSV	0.506	0.468	0.513	0.498	0.508	0.482	0.510
Internal consistency	0.865	0.815	0.856	0.868	0.845	0.823	0.837
Composite reliability	0.869	0.816	0.858	0.869	0.849	0.825	0.839

Note EU: ease of use, RP: responsiveness, FL: flexibility, EL: ease of learn, RL: reliability, CP: contextual performance, TP: task performance, Bold fonts indicate to square root of average variance extracted

in Table 1 demonstrated that both values of Cronbach's Alpha coefficient and McDonald's Omega coefficient were greater than 0.70, which is the lowest limit for judging on measurement reliability (De Leeuw et al., 2019).

5.2 *Structural Model*

The structural model illustrated no multicollinearity issue among predictor constructs because variance inflation factor (VIF) values are below the threshold of 5, as shown in Table 1 (Hair et al., 2017). This result is supported by the values of model fit indices shown in Figs. 1 and 2.

The results in Fig. 1 indicated that the chi-square to degrees of freedom (CMIN/DF) was 1.975, which is less than 3 the upper limit of this indicator. The values of the goodness of fit index (GFI), the comparative fit index (CFI), and the Tucker-Lewis index (TLI) were upper than the minimum accepted threshold of 0.90. Moreover, the result of root mean square error of approximation (RMSEA) indicated to value 0.046, this value is a reasonable error of approximation because it is less than the higher limit of 0.08. Consequently, the structural model used in this study was recognized as a fit model for predicting the DEP and generalization of its result (Ahmad et al., 2016; Shi et al., 2019). To verify the results of testing the study

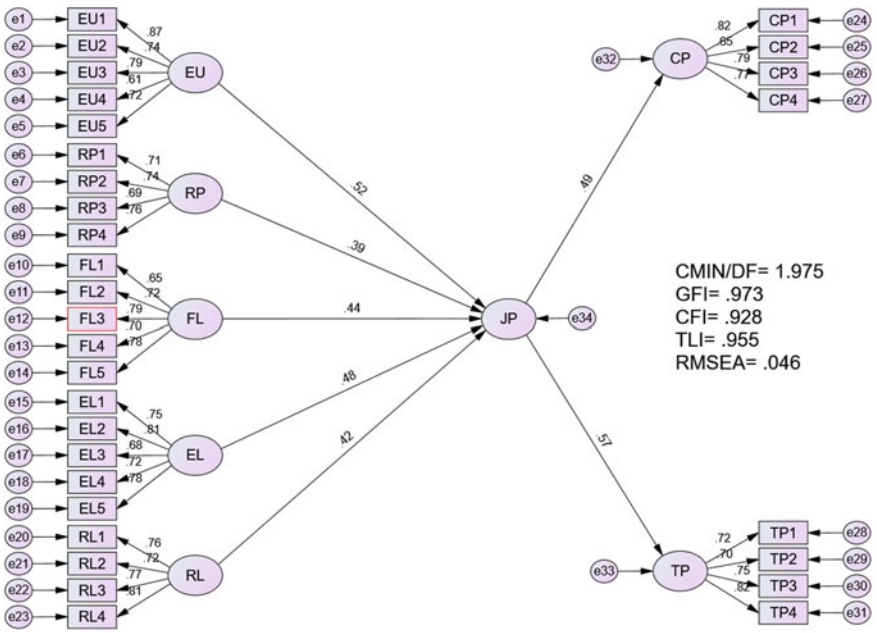

Fig. 2 SEM results of the quality of medical systems effect on job performance

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Table 2 Hypothesis testing

Relation	Standard Beta	*t* value	*p* value
EU → JP	0.521	22.68***	0.000
RP → JP	0.394	15.06*	0.03
FL → JP	0.438	18.29**	0.004
EL → JP	0.480	21.74***	0.000
RL → JP	0.423	17.03**	0.002

Note EU: ease of use, RP: responsiveness, FL: flexibility, EL: ease of learn, RL: reliability, JP: job performance, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

hypotheses, structural equation modeling (SEM) was used, the results of which are listed in Table 2.

The results demonstrated in Table 2 show that the highest impact was for ease of use ($\beta = 0.521$, $t = 22.68$, $p = 0.000$), followed by ease of learn ($\beta = 0.480$, $t = 21.74$, $p = 0.000$), then flexibility ($\beta = 0.438$, $t = 18.29$, $p = 0.004$), then reliability($\beta = 0.423$, $t = 17.03$, $p = 0.002$), and finally the lowest impact was for responsiveness ($\beta = 0.394$, $t = 15.06$, $p = 0.03$). Thus, all research hypotheses were supported based on these results.

6 Discussion

The results showed that the level of quality of medical information systems; Medium, and this indicates that private hospitals are keen to have modern medical information systems with high efficiency, due to their awareness of the importance and effectiveness of the quality of medical information systems. This has a significant and positive impact on the quality of services provided as a whole within the hospital. It was also found that the level of job performance in private hospitals in Jordan is average, attributing this to the stability and job security that hospitals provide to their employees, in addition to the high quality of working life compared to other hospitals working in the same field in the public sector, which increased the level of performance.

The results show that there is an impact of the quality of medical information systems on the job performance in private hospitals in Jordan, and this result can be justified by the fact that most of the work carried out by hospital employees depends mainly on the various applications of the medical information system, as the more varied the information systems used and the higher their efficiency in the implementation of the work, this led to the development of performance and speed of completion. Meaning that the higher the efficiency of the quality of medical information systems, the higher the level of functionality.

The results show that there is an impact of ease of use on the job performance in private hospitals in Jordan. It is evident from the above that a high percentage

of employees consider themselves qualified to deal with the modern system used in the hospital, and this indicates that they have high capabilities in dealing with information, which increases work efficiency and improves job level. It was also found that there is an impact of response time on the job performance in private hospitals in Jordan, and this result is attributed to the use of the various applications of the medical information system inside the hospital, and there is a comprehensive system that computerizes and links all departments and specializations, and it is relied on daily treatment as a form for the sick. The relevance and modernity of the software used serves to meet the user's information needs in a timely manner, which has a significant impact on the completion of tasks and functions and thus improves job performance.

The results show that there is an impact of flexibility on the job performance in private hospitals in Jordan, and the researchers attribute this result to the fact that the information provided by the medical system is commensurate with the needs of the job, and this indicates the follow-up of the senior management and the specialized technical team to the workflow based on the use of the medical system and with periodic feedback in order to develop the system, increase its effectiveness, and make it more compatible with work requirements, thus, job performance is improved. It was also found that there is an effect of ease of learning on the job performance in private hospitals in Jordan, and the researchers attribute this result to the conditions of employment followed by private hospitals, such as subjecting the employee to an exam to measure his computer skills and taking this into account when deciding to hire. Employees possess good levels of computer use as a result of the employment policy inside the hospital that requires tests to measure computer skills, in addition to the good relations linking employees with the specialized technical department, which facilitates understanding the users' needs of the system and addressing the problems they face during their use.

The results show that there is an impact of reliability on the job performance in private hospitals in Jordan, and this result is attributed to the good level of information provided by the medical system, which is commensurate with the needs of the job, in addition to the follow-up of the higher management of the workflow based on the use of the medical system and its effective management, and its implementation and management. More compatible with the work requirements and the flexibility of the hospital's organizational structure, which allows the flow of information easily, and all this has led to an improvement in the job performance.

7 Recommendations

Based on the results of the study, researchers recommend managers and decision-makers in private hospitals in Jordan to hold training courses in the field of using medical information systems for all employees in private hospitals, and to focus on maintaining these courses, and raising their levels in line with continuous technological developments and changes. Implementation of awareness campaigns

targeting employees in the medical fields on the importance of medical information systems in raising the level of job performance and the performance of hospitals in general. Helping the hospital to improve the quality of services provided to patients by increasing staff productivity, speeding up the completion of administrative and medical transactions, facilitating procedures, improving decision-making and reducing errors.

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Impact of Human Resources Management Strategies on Organizational Learning of Islamic Banks in Jordan

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Abstract The major aim of the study was to examine the impact of Human Resources Management strategies on Organizational Learning. Therefore, it focused on Islamic banks operating in Jordan. Data were primarily gathered through self-reported questionnaires creating by Google Forms which were distributed to a purposive sample of managers via email. The statistical program AMOSv24 was used to test the study hypotheses and achieve objectives. The study results demonstrated that Human Resources Management strategies have a positive impact relationship on Organizational Learning of Islamic banks operating in Jordan. Based on the study

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_46

results, researchers recommend managers of Islamic banks in Jordan to develop mechanisms that reward employees for learning new things, in a way that enhances adaptive and generative learning processes, and enhances confidence building among employees which allowing organizational learning processes of both adaptive and generative types.

Keywords Human Resources Management strategies · Organizational Learning · Islamic banks · Jordan

1 Introduction

In light of the great technological advances witnessed by the business world in recent decades, organizations are operating in an environment of intense competition and uncertainty conditions, which in turn led these organizations to research more in ways to deal with these conditions, and to identify the competitors' capabilities and the need of markets (Al-Hawary & Al-Hamwan, 2017; Al-Hawary & Hadad, 2016; Al-Hawary & Ismael, 2010). Organizational learning has become a prerequisite for business organizations to keep themselves updated with technological and competitive developments, Organizational learning involves the ability of an organization to adapt to emerging circumstances in its business environment and its ability to keep up with or compete with its competitors (Al-Hawary & Al-Namlan, 2018; Al-Hawary & Al-Syasneh, 2020). It is necessary to have a system that serves as an early warning for these organizations to predict future changes in their business environment, making the functions, activities and functions of human resources management in business organizations more complex and sophisticated, and need a large amount of data and information that help organizations to make decisions in a manner that supports and achieve its objectives through the management of their resources in an optimal way.

Organizations need to increase the pace of organizational learning to be able to cope with the dramatic changes in the contemporary business environment, and to achieve this; they need to be more open and receive new ideas and concepts (Al-Hawary et al., 2020). They need to innovate products and modern methods, train human resources and encourage innovation and creativity while doing business (Al-Hawary et al., 2018; Alameeri et al., 2021; Nuseir et al., 2021; Alzoubi et al., 2022). Organizations are treating human resources as intellectual energy, a source of information and knowledge, and innovations. They have also increased attention to

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these resources and created a healthy environment (Al-Hawary & Aldaihani, 2016; Al-Hawary & Alwan, 2016; AlHamad et al., 2022; Alshurideh et al., 2022). It has also increased attention to these resources and created a healthy environment work (Alameeri et al., 2020; Alshurideh et al., 2019). Despite the increasing importance of the study of organizational learning, and its role in achieving the goals of the organization, the concept of organizational learning has become one of the basic concepts that managers, researchers and practitioners have been interested in enhancing job satisfaction.

Human resources management is one of the most important functions of the organizations, where it performs many tasks, activities and functions that will provide efficient and qualified human resources suitable for the current and future needs of the organization, which should be able to contribute to the achievement of its objectives efficiently and effectively (Al Kurdi et al., 2021; Al-Hawary, 2011, 2015; Shamout et al., 2022). Past and current studies in strategic human resources management have indicated that human resources management already has an impact on the organizational outputs, and several studies have indicated that there is a relationship between human resources management and organizational performance (Huselid, 1995; Arthur 1994 Youndt. et al., 1996; Alkalha et al., 2012). Human resources management practice considered as an important source of competitive advantage (Wright et al., 2001).

2 Theoretical Framework and Hypotheses Development

2.1 Strategic Human Resources Management

The concept of strategic human resources management has played an important and leading role in management research for the past three decades (Boxall & Purcell, 2011). Continuous analysis in the field of strategic human resources management shows how this field has achieved added strategic value and contributed to organizational success. Human resources represent the critical and necessary resources in the performance of the organizations. The integration of human resources management with the organization's strategy results in more organizational effectiveness improves organizational performance and enhances business continuity, improvement and efficiency (Holbeche, 2001; Metabis & Al-Hawary, 2013; Zu'bi et al., 2012).

HRM is defined as a strategic and coherent approach to the management of individuals contributing to the achievement of organizational goals. This term was introduced as an alternative to the concept of people management. Human resources management has taken into consideration the focus on the strategic dimension of human resources management in the organizations, and in order to focus more on the concept of human resources management, the strategic dimension is added to refer

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to human resources management as a strategic function not only for building and activating organizations but also for seeking and creating sustainable competitive advantage (Holbeche, 2001; Obeidat et al., 2021), which means that the strategic dimension of human resources management requires to set long-term goals for these organizations, and take plans to allocate their resources for the achievement of long-term goals (Altamony et al., 2012).

Human resource management practices represent an intermediary factor between HRM strategies and HRM outputs (Al-Hawary & Nusair, 2017; Al-Hawary & Shdefat, 2016). Sheppeck and Militello (2000) divided the HRM strategy into four divisions: business skills and policies, supportive work environment, measurement and promotion of performance, and market organization. Guest (1997) divided them into three categories: differentiation through innovation, focus on quality, and decreasing cost. Stavrou-Costea (2005) concluded that effective human resource management may be a necessary factor in the success of the organization, and Lee and Lee's (2007) referred that HRM practices including: Training, teams, compensation and incentives, human resources planning, performance appraisal, and job stability, improve the organizational performance.

Strategic HRM represents a great insight into the integration of HRM functions with both strategic planning and operations in organizations, especially in circumstances where consumers and employees are constantly interacting and communicating. Strategic human resources management can be described as a strategy of an integrated organizational strategy that includes an effective environmental survey that works to achieve the organization's objectives (Nankervis et al., 2005; Schuler & Jackson, 1999). The strategic approach to human resources management requires from the manager of human resources to be responsive to the changes that may occur in the organization and the environment in which the organization operates (Devanna et al., 1981). Wilton (2006) found that large organizations adopt higher levels of HR practices than small organizations.

Strategic human resource management focuses on individuals as means to develop competitive advantage (Barber et al., 1999; Becker & Huselid, 1999). The human resources manager plays an important and critical role in the development of business plans, and strategies to serve the objectives of the Organization (Artis et al., 1999). Highly effective communication and information-sharing between managers and their subordinates reinforces them to engage in strategy formulation and implementation (Barber et al., 1999; Becker & Huselid, 2006). Strategic HRM requires integration of HR practices, and address of these practices as a whole rather than focusing on individual HRM practices (Al-Hawary & Metabis, 2012; Becker & Huselid, 2006; Combs et al., 2006). Integration of human resource practices leads the organization to achieve sustainable competitive advantage, because they are complex, unique, specific, accurate and difficult to imitate by other competitors (Al-Hawary et al., 2013; Pfeffer, 2005; Wright et al., 2003). This study adopts five strategies, which represent three basic functions of human resources management. These strategies are as follows:

Strategy for human resources formation: This strategy is concerned with ensuring timely access to human resources, and retention of the workforce to achieve synergies between performance requirements and organizational conditions of the environment. This strategy is designed in the light of the general human resources strategy with the aim of acquiring a workforce that meets the specifications of personal characteristics, skills and knowledge as well as possessing the ability of career advancement and future professional development. The HR formation strategy consists of a number of sub-activities that are interrelated in an integrated that enables organization to meet the human resources needs according to specific characteristics and traits to fill specific functions, the most important of these functions is the recruitment of human resources and then the selection and appointment of human resources, and these functions are one of the main activities in this strategy. Armstrong (2006: 154) noted that the human resource formation strategy works to provide the Organization with qualified human resource in the right quantity and quality, while sustaining these human resources and in harmony with the culture of the Organization.

Strategy of training and development: Training and development is a cornerstone in the advancement and success of organizations, so training is one of the supporting activities in the organization (Al-Hawary & Abu-Laimon, 2013; Alshraideh et al., 2017). The training activity is responsible for upgrading cognitive skills; this is in addition to the need to pay attention to the external environment and the need to diversify training programs in line with the environment in which the organization operates (Al-Hawary & Al-Kumait, 2017). Training and development department must have a strategic role in the organization, and in the design of the training process to achieve efficiency and efficiency in the completion of the work carried out by the organization in its field. The development and training function represents the next job of the recruitment function, and aims to teach the selected workers during the recruitment process the skills and knowledge necessary to perform the jobs. Training is known as planned efforts. Through development, skills and knowledge are expanded, and in order to achieve the goal of training and development. The skills and knowledge acquired during training must be transferred to practical application while performing tasks and duties (Mondy et al., 2012). The subject of training is one of the most important topics, as the training aims to give the trainees knowledge, skills and attitudes in order to develop their performance and professional development.

Work Quality Strategy: The quality of work life is represented by increasing the participation of employees in the decisions made by managers and reflected in the form of improving productivity through the optimal use of individuals more than money, in addition to improving security and job health, return and job satisfaction and reduce the turnover rate (Moroccan, 2007; Al-Hawajreh et al., 2011). Al-Salem believes that the quality of work life is represented in the positive aspects of the work environment from the perspective of employees. Whenever the management of the organization has overcome the difficulties in achieving the work of its employees, and provides an appropriate organizational environment and climate and respect of the employees, the result of this is the enhancement of the conviction of the employees

and the spirit of loyalty and belonging to the organization, which enhances job satisfaction, and reduces the work turnover in the organization.

Performance appraisal Strategy: This is a function that measures and evaluates the results of employees' performance, which identifies their opportunities for promotion and career path (Al-Hawary& Alajmi, 2017; Al-Lozi et al., 2018a, b; AlShehhi et al., 2020; Mohammad et al., 2020). This function is an incentive for further learning and development to keep pace with requirements and provides feedback on how employees benefit from the training and development they have received. And their need for other training and development programs (Byars, 2006; Alshurideh, 2019; Al Kurdi et al., 2020; Alsuwaidi et al., 2020; Kurdi et al., 2020).

Incentive and Remuneration Strategy: This strategy includes all the financial payments, bonuses and non-financial benefits provided by the organization to the employees for carrying out their work and activities, in order to attract qualified human resources, and maintain what is available in the organization, compensation is one of the most important factors that affect the motivation of individuals to grow, develop and continue Learning. Motivation is a critcal tool for greater productivity and improves the performance of the entire organization and achieves its goals (Al-Lozi et al., 2017; Casio, 2013).

2.2 Organizational Learning

Thomas and Allen define organizational learning as "the process that leads to continuous learning of the organization." Sun and Scott points out that organizational learning expresses "the learning process used in the organization, dealing with the question of how individuals learn within the organization." Hodgkinson argues that organizational learning occurs as a result of individuals' continuous interaction with each other during the learning process, resulting in their acquisition of experience. Farago refers to organizational learning as "all systems, mechanisms and processes used to continuously improve the capabilities of individuals, to achieve specific objectives concerning individuals and the organization." From the above definitions, it is noted that organizational learning reflects a process with specific components and mechanisms. This process is ongoing, as well as the need for interaction to improve the capacity of all members of the organization.

Finger and Brand argues that organizational learning is an activity and the process by which an organization can reach the stage of learning. This process generates new and useful ways of thinking to teach individuals how to work together. As a result of organizational learning, the organization reaches out to what is known as the Learning Organization. Organizational learning may be defined as: the continuous life cycle of the organization and the shared and planned vision to remain within the organizational community through a systematic effort and growing awareness stemming from the knowledge and experience of the leadership of the organization, and its competitive culture and strategy to bring about continuous change through

monitoring information constantly, and to benefit from its expertise and experience and solve its problems to bring it and its personnel to the level that ensures the achievement of its policy, and management goals with the highest degree of efficiency and competition, and take sound decisions and improve Organizational performance.

The real development of the organizational learning concept in the early 1990s by Senge, who introduced the idea of adaptive learning and generative learning (Al-Hawary & Obiadat, 2021). Adaptive learning focuses on adapting to what happens in an organizational environment, this type of learning helps the organization to survive, but does not provide organizational learning. Sun and Scott notes that this type of learning does not require much time and cost. Generative learning builds new capabilities and deliberately discards previous working methods. Generative learning is necessary in the operational aspect of an organization operating in a highly changing environment. This type of learning has high costs. Wijnhoven points out that what distinguishes adaptive learning from generative learning is that adaptive learning relates to simple change that relates to the first stage of the learning process, whereas generative learning relates to the advanced and complementary phase of adaptive learning, which improves the organization's ability to discover abilities to modify behavior and create new knowledge and experience. Organizational learning consists of two dimensions:

Adaptive Learning: This relates to the subordinates' learning of the skills needed to accomplish new business, and the business processes that lead to gradual development in order to ensure that these companies survive and continue.

Generative Learning: It relates to learning in which subordinates are interested in trying to imagine the future of the work that concerns them and try to design, and requires that subordinates have a high degree of autonomy to try good methods.

3 Study Model

See Fig. 1.

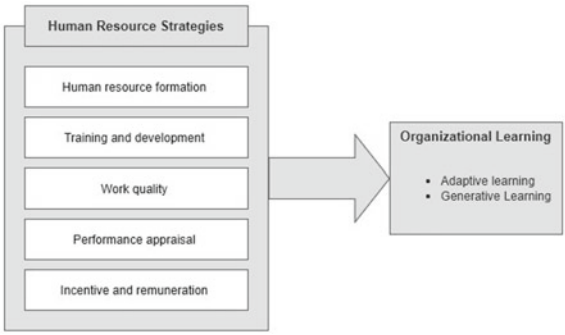

Fig. 1 Research model

H1: There is a statistically significant impact of Human Resources Management strategies on Organizational Learning of Islamic banks in Jordan.

4 Methodology

4.1 Population and Sample Selection

A qualitative method based on a questionnaire was used in this study for data collection and sample selection. The major aim of the study was to examine the impact of HRMS on OL. Therefore, it focused on Islamic banks operating in Jordan. Data were primarily gathered through self-reported questionnaires creating by Google Forms which were distributed to a purposive sample of managers via email. In total, (284) responses were received including (9) invalid to statistical analysis due to uncompleted or inaccurate. Hence, the final sample contained (275) responses suitable to analysis requirements, where it proved to be sufficient to the extent that was predictable and allowed for a presumption of data saturation (Sekaran & Bougie, 2016).

4.2 Measurement Instrument

A self-reported questionnaire that consists of two main sections along with a section regarding control variables was used as the measurement instrument. Control variables considered as categorical measures were composed of gender, age group, educational level, and experience. The two main sections were dealt with a five-point Likert scale (from 1 = strongly disagree to 5 = strongly agree). The first section contained (23) items to measure human resource management strategies based on (Al-Hawary & Metabis, 2012; Becker & Huselid, 2006; Combs et al., 2006). These items were distributed into dimensions as follows: items (HRF1-HRF5) were used to measure human resource formation strategy, (TDS1-TDS5) were dedicated for measuring training and development strategy, (WQS1WQS4) were used to measurework quality strategy, (PAS1-PAS4) were dedicated for measuring performance appraisal strategy, and (IRS1-IRS5) were dedicated for measuring incentive and remuneration strategy. Whereas the second section included eightitems developed to measure organizational learning according to what was pointed by Wijnhoven. OL was divided into two main dimensions: adaptive learning (ADL1-ADL4) and generative learning (GEL1-GEL4).

5 Findings

5.1 Measurement Model Evaluation

This study was conducted structural equation modeling (SEM) to test hypotheses, which represents a contemporary statistical technique for testing and estimating the relationship between factors and variables (Wang & Rhemtulla, 2021). Accordingly, the reliability and validity of the constructs were tested using confirmatory factor analysis (CFA) through the statistical program AMOSv24. Table 1 summarizes the results of convergent and discriminant validity, as well the indicators of reliability.

Table 1 shows that the standard loading values for the individual items were within the domain (0.592–0.881), these values greater than the minimum retention of the elements based on their standard loads (Al-Lozi et al., 2018a, b; Sung et al., 2019). Average variance extracted (AVE) is a summary indicator of the convergent validity of constructs that must be above 0.50 (Howard, 2018). The results indicate that the AVE values were greater than 0.50 for all constructs, thus the used measurement model has an appropriate convergent validity. Rimkeviciene et al. (2017) suggested the comparison approach as a way to deal with discriminant validity assessment in covariance-based SEM. This approach is based on comparing the values of maximum shared variance (MSV) with the values of AVE, as well as comparing the values of square root of AVE ($\sqrt{}$AVE) with the correlation between the rest of the structures. The results show that the values of MSV were smaller than the values of AVE, and that the values of $\sqrt{}$AVE were higher than the correlation values among the rest of the constructs. Therefore, the measurement model used is characterized by discriminative validity. The internal consistency measured through Cronbach's Alpha coefficient (α) and compound reliability by McDonald's Omega coefficient (ω) was conducted as indicators to evaluate measurement model. The results listed in Table 1 demonstrated that both values of Cronbach's Alpha coefficient and McDonald's Omega coefficient were greater than 0.70, which is the lowest limit for judging on measurement reliability (de Leeuw et al., 2019).

5.2 Structural Model

The structural model illustrated no multicollinearity issue among predictor constructs because variance inflation factor (VIF) values are below the threshold of 5, as shown in Table 1 (Hair et al., 2017).This result is supported by the values of model fit indices shown in Fig. 1 (Fig. 2).

The results in Fig. 1 indicated that the chi-square to degrees of freedom (CMIN/DF) was 1.454, which is less than 3 the upper limit of this indicator. The values of the goodness of fit index (GFI), the comparative fit index (CFI), and the Tucker-Lewis index (TLI) were upper than the minimum accepted threshold of 0.90.

Table 1 Results of validity and reliability tests

Constructs	1	2	3	4	5	6	7
1. HRF	**0.743**						
2. TDS	0.458	**0.759**					
3. WQS	0.385	0.496	**0.745**				
4. PAS	0.492	0.538	0.513	**0.737**			
5. IRS	0.538	0.506	0.497	0.528	**0.726**		
6. ADL	0.671	0.695	0.711	0.662	0.682	**0.765**	
7. GEL	0.702	0.655	0.680	0.635	0.675	0.698	**0.781**
VIF	3.591	2.663	2.067	3.359	1.938	–	–
LR	0.627–0.833	0.682–0.821	0.607–0.861	0.592–0.837	0.674–0.761	0.702–0.830	0.706–0.881
AVE	0.552	0.577	0.555	0.544	0.527	0.585	0.610
MSV	0.468	0.503	0.394	0.510	0.437	0.462	0.507
α	0.856	0.868	0.829	0.822	0.845	0.848	0.858
ω	0.859	0.871	0.831	0.824	0.847	0.849	0.861

Note VIF: variance inflation factor, LR: loading ranges, AVE: average variance extracted, MSV: maximum shared variance, α: Cronbach's alpha, ω: MacDonald's omega, Bold font refer to $\sqrt{AVE}$

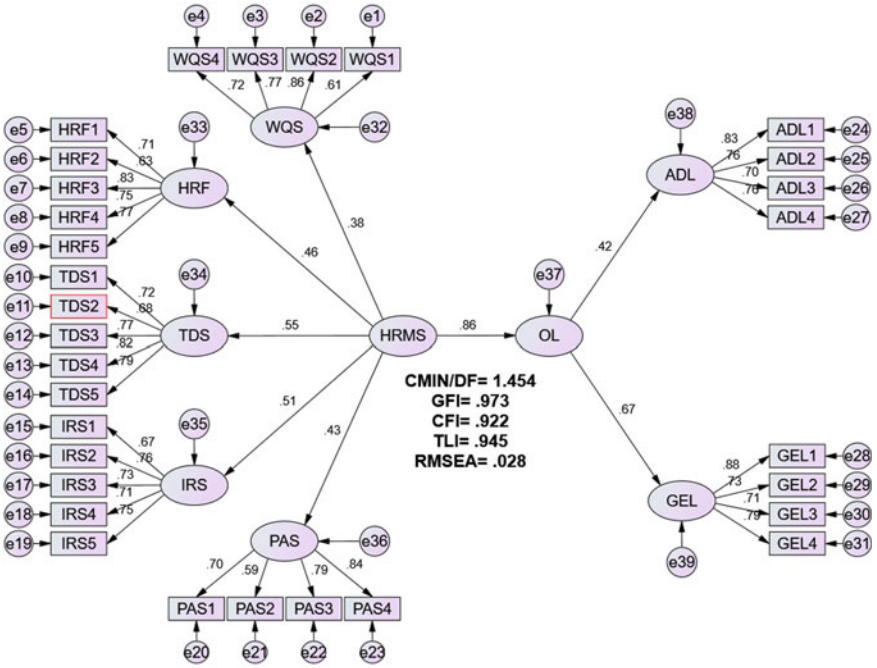

Fig. 2 SEM results of the HRMS effect on OL

Moreover, the result of root mean square error of approximation (RMSEA) indicated to value 0.028, this value is a reasonable error of approximation because it is less than the higher limit of 0.08. Consequently, the structural model used in this study was recognized as a fit model for predicting the DEP and generalization of its result (Ahmad et al., 2016; Shi et al., 2019).To verify the results of testing the study hypotheses, structural equation modeling (SEM) was used, the results of which are listed in Table 2.These results demonstrated that HRMS has a positive impact relationship on OL ($\beta = 0.858$, $t = 41.86$, $p = 0.000$), which justifies support for the study's major hypothesis.

Table 2 Hypothesis testing

Relation	Standard Beta	*t* value	*p* value
HRMS → OL	0.858	41.86***	0.000

Note HRMS: human resource management strategies, OL: organizational learning, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

6 Conclusion and Recommendations

The researcher concludes that companies, through their management, seek to focus on human resources management strategies in order to improve their performance of tasks and achieve their objectives, but they need to make a greater effort in this area, management is convinced of the importance of human resources strategies through working on the formation of human resources (recruitment, selection and appointment), because of its impact on the conduct of its operation, This result is a reflection of the employees' view of the importance of attracting distinguished human resources through evaluation of applicants before choosing to work and then appoint them, as the management is aware of the capabilities of every individual, helping management to identify actions that can be assigned to them. Due to the variety of tasks, the management is keen to select workers with diverse experience.

HR strategies contribute to enhance organizational learning. The function of training and development contributes to the building of organizational learning significantly, which requires strengthening the relationship between training and the development of human resources, because; training includes broad approaches to reshape all human resources management strategies. The results of the study indicate that there is an interest in learning, and the sources of obtaining it from the point that it collects information and data from the departments, and give warning signals about everything that happens in the external environment, and try to deal with it positively, and works to achieve the principle of participation among employees in the expertise and experience they possess, these operations are based on the formal structure owned by organization, and enhance the flow of knowledge through it, in addition to the application, and activation of work teams in most of the operations.

The results of the study showed an impact of human resources strategies (training and development, quality of work life, incentives and rewards) on organizational learning. The results show that there is an impact of training and development strategies, quality of work life, incentives and rewards and no impact of human resources formation and performance evaluation strategies on organizational learning. This result indicates that organizational learning processes need a long time and to be reinforced through incentives and rewards. It also needs a good organizational climate mechanism that leads to the consolidation and validation of information through training and knowledge programs. The result of the study agreed with Al-Kasasbeh et al., Momeni and Pourdsaid and Kumar and Idris (2006).

Based on the study results, researchers recommend managers of Islamic banks in Jordan to develop mechanisms that reward employees for learning new things, in a way that enhances adaptive and generative learning processes, and enhances confidence building among employees which allowing organizational learning processes of both adaptive and generative types. In addition; emphasizing the need to give workers the opportunity to freely choose when carrying out work duties, in a way that achieves competence and flexibility in carrying out work and enhances their satisfaction. Also departments management have to collect information and ideas

from their practical experience in a way that enhances the enrichment of adaptive and generative organizational learning processes, and transfers them to other workers in various departments.

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The Impact of Organizational Structure Characteristic on Administrative Communication Efficiency: Evidence from Telecommunication Companies in Jordan

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Abstract The major aim of the study was to examine the impact of organizational structure characteristic on administrative communication efficiency. Therefore, it focused on telecommunication companies operating in Jordan. Data were primarily gathered through self-reported questionnaires creating by Google Forms which were distributed to a purposive sample of managers at different levels via email.

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_47

Structural equation modeling (SEM) was used to test hypotheses. The study results showed that organizational structure characteristic has a positive impact on administrative communication efficiency. Based on the results of the study, the researchers recommend managers and decision makers to pay more attention to the dimensions related to the characteristics of the organizational structure (specialization and flexibility) that will affect the enhancement of the level of effectiveness of administrative communication.

Keywords Organizational Structure Characteristic · Administrative Communication Efficiency · Telecommunication companies · Jordan

1 Introduction

Human organization has existed and developed since the dawn of history. Man, by nature, cannot live in isolation from others, so human groups emerged, and these groups did not find a way to organize except by choosing a leader for this group who addresses its problems, settles its affairs and achieves harmony among its members. With the passage of time, organizations appeared that soon played a major role in our daily lives, whether at the level of individual life or on the level of society as a whole or the scope of the economy (Al-Hawary, 2011; Al-Hawary & Al-Hamwan, 2017; Al-Nady et al., 2016). It is difficult to imagine modern societies without these organizations that have spread rapidly to provide goods and services to the public, which calls for studying these organizations, and their structural construction to provide the appropriate conditions for their survival, growth and continuity and creativity, and providing goods and services to the beneficiaries (Al-Hawary, 2015; Al-Hawary & Aldaihani, 2016; Alsharari & Alshurideh, 2020; Bebba et al., 2017). Also, good communication means the blood that runs in the veins of organizations, and lack of effective communication is often the problem of organizations and one of their important obstacles (Aljumah et al., 2021; Alshurideh et al., 2014; Alyammahi et al., 2020). Both sides of the communication process have different desires, trends and needs, and this represents an important obstacle to the success of this process (Alshurideh et al., 2019; Alameeri et al., 2020; Alshurideh, 2022).

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Communication can be defined as a social process by which an individual communicates with others to achieve common interests or benefits through cooperation, or conflicts and incompatibility in the event of competition and conflict as a method of dealing (Al-Hawary & Batayneh, 2010). It can also be said that the process of communication, as defined by the Oxford Dictionary, is "the transfer of ideas and information and their communication or exchange by words, writing or sign." Information or ideas are exchanged between a sender and a receiver or a sender and two receivers. When we speak, we want someone to hear us. When we write, we want someone to read us, when we use gestures and smiles, we want someone to receive and respond to them with similar gestures. The importance of the organizational structure in the life and continuity of organizations, whether governmental or private, highlights its interest in dividing and distributing work among individuals and its role in unifying efforts in order to achieve the goals of the organization, preventing overlapping of powers and reducing conflicts over competencies, and its role is also in the optimal use of human competencies in terms of distributing job roles, defining activities and facilitating the process of managerial communication between managerial levels (Al-Hawary et al., 2011; Nuseir et al., 2021; AlHamad et al., 2022; Alshurideh et al., 2022; Shamout et al., 2022). The current study comes to identify the impact of the characteristics of the organizational structure on the effectiveness of administrative communication.

2 Theoretical Framework and Hypotheses Development

2.1 Organizational Structure Characteristics

The issue of the organizational structure has occupied and continues to be an important space in administrative and organizational thought, and it is still receiving increasing attention by thinkers, consultants and managers; this is because it is a vital way to help organizations accomplish their work and achieve their goals efficiently and effectively (Al-Hawary, 2009; Al-Hawary et al., 2012; Agha et al., 2021). Because it is a major variable that affects many variables and organizational aspects of any organization. The attention of thinkers and researchers focused on determining the dimensions of the organizational structure and their relationship to the organizational performance, its efficiency, effectiveness, flexibility, adaptability, and other criteria for the success of organizations that were mentioned in many studies related to measuring the performance and success of organizations (Alhalalmeh et al., 2020; Al-Hawary & Mohammed, 2017; Mohammad et al., 2020; Al-Hawary & AlDafiri, 2017; Kabrilyants et al., 2021). The managerial literature indicated that there is no general agreement on one comprehensive definition of the organizational structure, as the views and concepts they presented varied in terms of comprehensiveness and depth, but they see that the organizational structure is only a means and a tool to

achieve the goals of the organization (Al-Hawajreh et al., 2011; Aburayya et al., 2020).

Robbins defines the organizational structure as "the way in which tasks are organized and the main roles of employees are defined, and the information exchange system is identified and the coordination mechanisms and interaction patterns necessary between the different departments and their employees are identified." Hall believes that the idea of the organizational structure can be similar to the structure of the building that has pillars, walls, ceilings and cabins, and it is this structure that determines the movements and activities of the individuals who are inside it. Daft (1986) defines the organizational structure as a reflection of the organizational map, which is a clear representation of all activities and operations in organizations.

Organizational structure is a complex concept and it cannot be considered as a single element. Some writers link the organizational structure to the chain of authority, the scope of supervision, the division of labor, and so on (Ahmad et al., 2021; Alameeri et al., 2021). As is the difference in defining the definition of the organizational structure, there is a difference in defining its characteristics. Robbins refers to that difference that the organizational structure consists of complex, formal, and centralization. As for the team of researchers from Aston School, they see that the organizational structure consists of formality, specialization and centralization, formality and profiling. In view of the lack of consensus on the main characteristics of the organizational structure, and the opinion of most researchers about the main characteristics of the organizational structure revolved around: (complexity, formality, centralization, flexibility, and specialization), the study will adopt these characteristics as dimensions of the organizational structure, which are as follows.

Complexity: It refers to "the amount and volume of work that reflects lines of authority, verticality, geographical dimension of organizational units, and difficulty of coordination". The organizational structure also represents the number of activities, jobs and departments within the organization, the degree of specialization, division of work, managerial levels, and geographical locations (Al-Hawary & Al-Syasneh, 2020; Mohammad, 2020). The more these elements increase, the more complex the organizational structure. The importance of complexity arises in that when the degree of complexity of the organizational structure increases, the organization's need for communication, coordination and control increases. This places an increasing burden on management towards more communication and better control (Al Kurdi et al., 2020; Alshura et al., 2016).

Formalization: The term formality refers to the extent to which the organization relies on laws, regulations, rules, and directives to pressure the behavior of individuals during work, and the degree of formality may change significantly between organizations and within a single organization, as there are certain businesses that do not need high formality. Formality varies according to the standard of craftsmanship, or the degree of skill, and it also varies according to the managerial levels (Mohammad et al., 2020; Al-Hawary & Shdefat, 2016; Mohammad et al., 2014; Allahow et al., 2018). The nature of work in the management owned by the manager increases as he rises to the top in the organizational structure of the organization.

Centralization: It refers to the degree of distribution of decision-making power in the organization at any level, and the more the decision-making right is limited to the higher levels of the organization, the more this indicates a high degree of centralization in the organization and vice versa (Ahmed et al., 2020; Al-Tarawneh et al, 2012; Harahsheh et al., 2021).

Specialization: It means "the degree of dividing the organization's tasks into separate sub-works from each other. If the specialization is accurate, we will find that each of the workers performs limited tasks, but if the specialization is inaccurate, we find each worker performs a wide range of tasks."

Flexibility: It refers to the ability of the organizational structure to self-change, and it depends on the degree of response in the structure to the processes of change resulting from the internal and external developments and influences imposed by its self-capacity for expansion and absorption (Al-Lozi et al., 2017; Al-Hawary & Al-Syasneh, 2020; Alkitbi et al., 2020).

2.2 Administrative Communication

Studies and research indicate that communication in public organizations represents the lifeblood of these organizations, and the backbone on which they depend to provide their services to all beneficiaries. In this regard, it should be noted that public organizations, in their essence and orientations, are institutions that work for the common good, and not for the benefit of a particular group or party at the expense of others. Therefore, the basis for its survival depends on its ability to communicate with the broad segments of people who find in the services of these institutions a safe and sure haven away from the cases of attrition and waste that result from the behavior of some business organizations (Al-Hawary et al., 2020; Al-Nady et al., 2013; Metabis & Al-Hawary, 2013). Also, public organizations is a term that refers to all institutions that provide goods, services and ideas and provide advice and guidance to citizens based on their orientation to the citizen and their adoption of methods that would advance the society and its members. On this basis, the organizations' orientations are often societal and ethical.

Daft defined communication as: "the use of words, letters or any similar means to share information about a topic or an event." Effective communication means "the occurrence of a perfect match between the meaning sent by the sender and the meaning understood by the receiver. Whereas, efficient communication means that communication takes place at the lowest possible cost, and communication in order to be successful must be efficient and effective at the same time." (Al-Hawary & Metabis, 2012; Al-Hawary & Nusair, 2017; Al-Hawary & Obiadat, 2021). The efficiency of the communication process depends on the extent to which the two parties to the communication (the sender and receiver) understand each other. Some management scholars, in defining the effectiveness of communication, tend to determine the return on behavior that is issued by an individual after the communication, without

paying attention to the individual from whom that behavior originates. Therefore, effectiveness is defined as "a characteristic of the behavior in which you expend energy and have a financial impact."

2.3 The Organizational Structure and the Effectiveness of Administrative Communication

The organizational structure is a mechanism to achieve the goals that organizations seek to achieve, as the organization has been found to achieve certain goals. A good organizational structure helps to focus efforts to link activities with the goals to be achieved, clarify how work flows, and avoid duplication of work and conflict in tasks. The organizational structure serves the organization by enabling it to make optimal use of the available resources, whether financial or human, which leads to an increase in the organization's ability to implement its goals easily and smoothly, facilitating and avoiding overlap and duplication between the various administrative processes and activities, defining the roles of individuals working in the organization, and reducing pressures Work, and contributes to increasing the ability of organizations to deal with internal and external variables that the organization may be exposed to, and helps avoid work differences.

The success of the organization in building a successful organizational structure depends on its ability to work to find an appropriate work environment and its ability to achieve a high degree of adaptation, congruence and harmonization between its organizational structure and its objectives, as well as the efficiency of the human element, and its material resources, this shows the importance of the organizational structure of the organization. Without a good appropriate organizational structure, the organizational processes go in a chaotic manner that is not based on a solid practical basis, as the organization flounders and deviates from its path and its goals, becoming useless and heading for decline, in addition to wasting human and material resources. An inappropriate organizational structure has negative effects in terms of low Morale and motivation of employees, improper decision-making, increased organizational and job conflicts, decreased ambition and creativity, and increased expenditures. Based on the above, the hypothesis of the study can be formulated as follows.

There is an effect of the characteristics of the organizational structure on the effectiveness of administrative communication.

3 Study Model

See Fig. 1.

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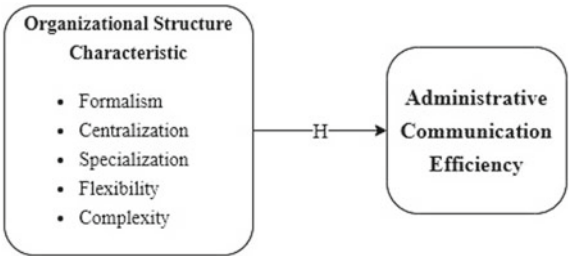

Fig. 1 Research model

4 Methodology

4.1 Population and Sample Selection

A qualitative method based on a questionnaire was used in this study for data collection and sample selection. The major aim of the study was to examine the impact of organizational structure characteristic on administrative communication efficiency. Therefore, it focused on telecommunication companies operating in Jordan. Data were primarily gathered through self-reported questionnaires creating by Google Forms which were distributed to a purposive sample of managers at different levels via email. In total, (173) responses were received including (18) invalid to statistical analysis due to uncompleted or inaccurate. Hence, the final sample contained (155) responses suitable to analysis requirements, where it proved to be sufficient to the extent that was predictable and allowed for a presumption of data saturation (Sekaran & Bougie, 2016).

4.2 Measurement Instrument

A self-reported questionnaire that consists of two main sections along with a section regarding control variables was used as the measurement instrument. Control variables considered as categorical measures were composed of gender, age group, educational level, and experience. The two main sections were dealt with a five-point Likert scale (from 1 = strongly disagree to 5 = strongly agree). The first section contained (21) items to measure organizational structure based on (Daft, 1986). These items were distributed into dimensions as follows: four items dedicated for measuring formalism (FO1-FO4), four items dedicated for measuring centralization (CE1-CE4), five items dedicated for measuring specialization (SP1-SP5), four items dedicated for measuring flexibility (FL1-FL4), and four items dedicated for measuring complexity (CO1-CO4). Whereas the second section included six items developed to measure administrative communication efficiency (ACE1-ACE6) according to what was pointed by (Al-Hawary & Batayneh, 2010).

5 Findings

5.1 Measurement Model Evaluation

This study was conducted structural equation modeling (SEM) to test hypotheses, which represents a contemporary statistical technique for testing and estimating the relationship between factors and variables (Wang & Rhemtulla, 2021). Accordingly, the reliability and validity of the constructs were tested using confirmatory factor analysis (CFA) through the statistical program AMOSv24. Table 1 summarizes the results of convergent and discriminant validity, as well the indicators of reliability.

Table 1 shows that the standard loading values for the individual items were within the domain (0.641–0.864), these values greater than the minimum retention of the elements based on their standard loads (Al-Lozi et al., 2018; Sung et al., 2019). Average variance extracted (AVE) is a summary indicator of the convergent validity of constructs that must be above 0.50 (Howard, 2018). The results indicate that the AVE values were greater than 0.50 for all constructs, thus the used measurement model has an appropriate convergent validity. Rimkeviciene et al. (2017) suggested the comparison approach as a way to deal with discriminant validity assessment in covariance-based SEM. This approach is based on comparing the values of maximum shared variance (MSV) with the values of AVE, as well as comparing the values of square root of AVE ($\sqrt{}$AVE) with the correlation between the rest of the structures. The results show that the values of MSV were smaller than the values of AVE, and that the values of $\sqrt{}$AVE were higher than the correlation values among the

Table 1 Results of validity and reliability tests

Constructs	1	2	3	4	5	6
1. FO	**0.769**					
2. CE	0.514	**0.779**				
3. SP	0.442	0.439	**0.756**			
4. FL	0.527	0.495	0.552	**0.774**		
5. CO	0.439	0.537	0.506	0.486	**0.776**	
6. ACE	0.698	0.715	0.708	0.725	0.702	**0.754**
VIF	1.647	1.254	2.778	2.366	2.013	–
Loadings range	0.691–0.884	0.653–0.846	0.642–0.822	0.711–0.824	0.675–0.836	0.641–0.864
AVE	0.591	0.607	0.571	0.598	0.602	0.568
MSV	0.517	0.531	0.492	0.503	0.524	0.484
Internal consistency	0.848	0.854	0.866	0.855	0.854	0.883
Composite reliability	0.851	0.860	0.868	0.856	0.857	0.886

Note Bold fonts refer to square root of average variance extracted

rest of the constructs. Therefore, the measurement model used is characterized by discriminative validity. The internal consistency measured through Cronbach's Alpha coefficient (α) and compound reliability by McDonald's Omega coefficient (ω) was conducted as indicators to evaluate measurement model. The results listed in Table 1 demonstrated that both values of Cronbach's Alpha coefficient and McDonald's Omega coefficient were greater than 0.70, which is the lowest limit for judging on measurement reliability (De Leeuw et al., 2019).

5.2 Structural Model

The structural model illustrated no multicollinearity issue among predictor constructs because variance inflation factor (VIF) values are below the threshold of 5, as shown in Table 1 (Hair et al., 2017).This result is supported by the values of model fit indices shown in Fig. 2.

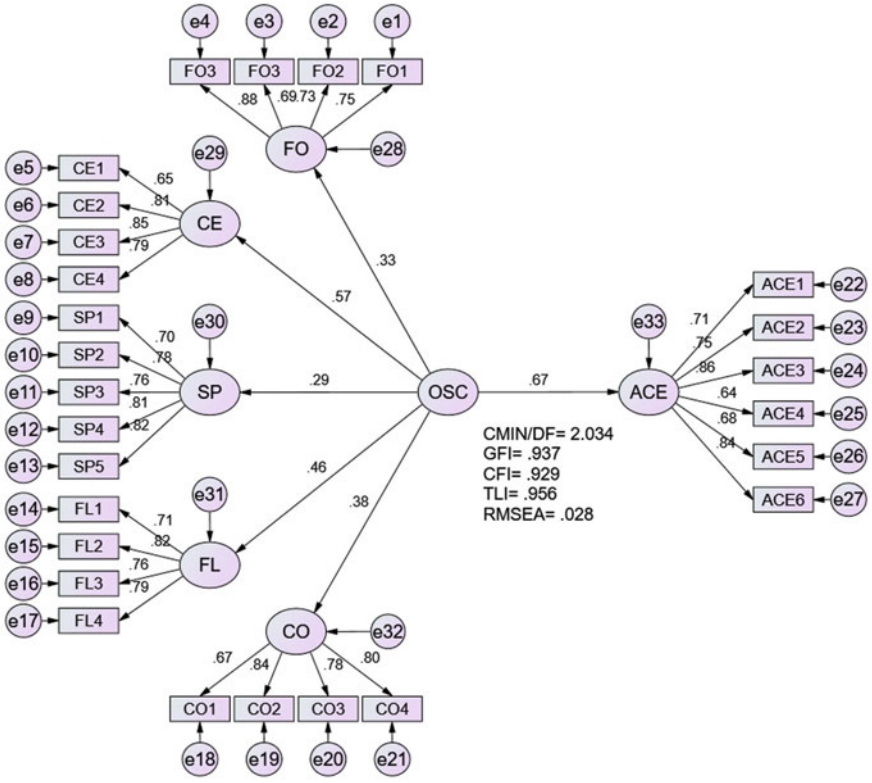

Fig. 2 SEM results of the organizational structure characteristic effect on administrative communication efficiency

Table 2 Hypothesis testing

Relation	Standard Beta	*t* value	*p* value
OSC → ACE	0.675	27.59***	0.000

Note OSC: organizational structure characteristic, ACE: administrative communication efficiency,* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

The results in Fig. 2 indicated that the chi-square to degrees of freedom (CMIN/DF) was 2.034, which is less than 3 the upper limit of this indicator. The values of the goodness of fit index (GFI), the comparative fit index (CFI), and the Tucker-Lewis index (TLI) were upper than the minimum accepted threshold of 0.90. Moreover, the result of root mean square error of approximation (RMSEA) indicated to value 0.028, this value is a reasonable error of approximation because it is less than the higher limit of 0.08. Consequently, the structural model used in this study was recognized as a fit model for predicting the DEP and generalization of its result (Ahmad et al., 2016; Shi et al., 2019).To verify the results of testing the study hypotheses, structural equation modeling (SEM) was used, the results of which are listed in Table 2.

The results demonstrated in Table 2 show that organizational structure characteristic has a positive impact relationship on administrative communication efficiency ($\beta = 0.675$, $t = 27.59$, $p = 0.000$), which justifies support for the study's major hypothesis.

6 Conclusion and Discussion

The study aimed to identify the effect of the organizational structure characteristics on the effectiveness of administrative communications. The results of the study showed the confirmation of these characteristics, particularly centralization and complexity, as components of the organizational structure, and they represent one of its characteristics. The results of the study indicated that the effectiveness of administrative communication was affected by factors and variables other than the dimensions of the characteristics of the organizational structure. The researchers attribute this result to the fact that there are other factors that may have an impact, including the case of informal structures, or that there are informal groups that play an important role in guiding the communication system.

The results showed that the formal dimension had an effect on the effectiveness of administrative communications. The researchers attribute the reason for this to the fact that the formality applied in the private sector is less compared to the public sector, since business organizations follow the approach to achieving profit, which requires open relations between the parties, which makes formality less effective in influencing the effectiveness of administrative communications. The results showed that the centralization dimension has an impact on the effectiveness of administrative communication. The researcher can explain this on the grounds that organizational

structures in business organizations follow a horizontal communication pattern that allows a kind of delegation to act in situations that do not require the intervention of senior management. This appears through the activities and processes carried out by the middle and lower departments of reporting and defining the duties entrusted to managers. It is clear from the results that the dimension of specialization has an impact on the effectiveness of administrative communication. The researchers attribute this result to the fragmentation of business that characterizes the organizational structure, in addition to the decrease in the number of working departments, in order to reduce the costs involved, as the private sector announces the principle of efficiency and effectiveness and not the principle of social goals.

The results indicated that the flexibility dimension has an effect on the effectiveness of administrative communication. From the researcher's point of view, this result is due to the fact that business organizations operate in an unstable environment, which makes the response to the environment highly dynamic, in addition to keeping pace with technological developments. The results indicated that the dimension of formality has an impact on the effectiveness of administrative communications, which means that the lines of communication between the various departments and departments affiliated to it are somewhat unclear to a high degree due to the interference of stakeholders in many activities and operations. It is clear that the complexity dimension has an impact on the effectiveness of administrative communication. This indicates that the organizational structure does not have a large number of administrative levels, which means that the vertical differentiation in the organizational structure does not exist, as well as that the horizontal departments are not a large number, which means that the horizontal differentiation is one of the components of the organizational structure.

7 Recommendations

Based on the results of the study, the researchers recommend managers and decision makers to pay more attention to the dimensions related to the characteristics of the organizational structure (specialization and flexibility) that will affect the enhancement of the level of effectiveness of administrative communication, and to try to pay attention to the dimensions related to the effectiveness of administrative communication and study them at the individual level and at the organizational level as a tool to measure the extent to which the administrative communication system has been verified and its effectiveness to achieve the set goals, In addition to raising awareness and the participation of managers in decision-making, especially with regard to the administrative communication system to increase its effectiveness through the selection of the communication system, lines of communication and effective means of communication, and preparing managers to improve the communication system as an administrative approach. And finally, designing the organizational structure in a way that achieves the effectiveness of administrative communication and facilitates

the process of administrative communication between the president and subordinates in all directions.

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Develop a Causal Model for the Impact of Critical Success Factors of the Strategic Information System in Promoting Human Resources Management Strategies in the Social Security Corporation

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Abstract This study aimed to analyze the impact of critical success factors of strategic information system on the strengthening human resources management strategies in the Social Security Corporation. The study population was made up of 120 members of the directors and chiefs of sections of the Social Security Corporation. Structural equation modeling (SEM) was conducted to test hypotheses. The study found a statistically significant impact of the critical factors of the strategic information system on the human resources management strategies of the Social Security Corporation. The study recommended that attention should be given to

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_48

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strengthening top management support for its important role in strengthening human resources management strategies and the strategic information system.

Keywords Strategic Information Systems · Human Resources Management Strategies · Social Security Corporation · Jordan

1 Introduction

Information is a basic pillar for the effectiveness of decisions in the organization, and for the success of the strategic information system, it is necessary to identify the critical success factors for the strategic information system, which is one of the important and necessary means for the development and distinction of organizations, which in turn constitutes a basic process for the success or failure of the strategic information system, which must be adhered to and taken into consideration (AlTaweel & Al-Hawary, 2021; Al-Hawary & Al-Syasneh, 2020; Al-Quran et al., 2020; Al-Hawary et al., 2020; Al-Hawary & Obiadat, 2021; Allahow et al., 2018; Al-Hawary & Alhajri, 2020; Altarifi et al., 2015; Al-Hawary & Hussien, 2017; Al-Hawary & Al-Smeran, 2017; Al-Hawary & Al-Menhaly, 2016; Al-Hawary & Ismael, 2010).

Since the human resource is considered one of the main and necessary resources for any organization, and this resource is the first responsible for the implementation of all functions and activities related to the organization, therefore, this resource is the main nerve for organizations (Alhalalmeh et al., 2020; Hijjawi & Mohammad, 2019; Al-Hawary, 2015; Al-Lozi et al., 2017; Al-Hawary & Mohammed, 2017; Al-Hawary et al., 2012; Al-Hawary, 2009), and in order for these human resources to accomplish their various activities, they urgently need to find strategies to manage human resources and support them through a strategic information system capable of processing data and information and supporting the decision maker in achieving and completing various activities in organizations in general and the Social Security Corporation especially (Abu Zayyad et al., 2021; Alaali et al., 2021). Therefore, there is a link between the completion of the tasks and activities of the management of the organization and its various activities, especially the strategy and the strategic information system in the organization, where the information system and human resources are an integral part of the strategies that organizations must care about and interact with to achieve the vision and objectives of the organization, it plays an

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important and essential role in achieving the success and distinction of organizations (Al-Dmour et al., 2021; Alzoubi et al., 2022).

Human resource management strategies are indispensable in all business organizations, as they need to provide comprehensive strategic information, and this information is a capital resource for organizations, which in turn leads to an increase in the effectiveness of human resource management outputs, to achieve this, an efficient and effective strategic information system must be harnessed through commitment by the organization to identify the critical success factors for this system (Alameeri et al., 2021; Al-Hawary & Al-Namlan, 2018; Alshurideh et al., 2019a, b). Human resources are considered a very important main element and they play an important and essential role in achieving the success and distinction of organizations, and the effectiveness of human resources management strategies greatly contribute to this, so it is necessary to pay attention to these strategies by the organization to ensure the achievement of excellence and provide high levels of performance (Alkalha et al., 2012; AlHamad et al., 2022; Alshurideh et al., 2022).

The effectiveness of human resource management strategies is determined by understanding the organization's internal and external environment, its requirements and basic variables (Al Kurdi et al., 2021; Shamout et al., 2022). To achieve this, a strategic information system must be harnessed and work to identify the critical success factors for this system. Given the social and economic importance of the Social Security Corporation, this importance has raised in the mind of the researcher the importance of having an effective system for human resource management as it represents the cornerstone in all the activities carried out by this national institution, and from this point of view, and to determine the effectiveness of the management strategies Human resources applied in the Social Security Corporation. The researchers conducted a number of interviews with a number of department heads at the various administrative levels in the Social Security Corporation and it was found that there is a lack of awareness among managers of the concept and application of a number of human resource management strategies, in addition to a lack of awareness of the importance of critical success factors for the strategic information system applied in the institution. This study seeks to identify the role of critical success factors for the strategic information system in enhancing human resource management strategies in the Social Security Corporation (Al-Dmour et al., 2021; Ashal et al., 2021; Ben-Abdallah et al., 2022).

2 Theoretical Framework and Hypotheses Development

2.1 Critical Success Factors of a Strategic Information System

The critical success factors are among the necessary topics in management literature in general, and information systems literature in particular. With regard to applications in the field of information systems, it should be noted that strategic information systems are in themselves one of the most important critical success factors in the life of organizations (Al-Taie and Al-Khafaji, 2009; Altamony et al., 2012).

Critical success factors play an important role in the failure or success of the information system and the organization, as they contribute significantly to helping business organizations identify information systems that need to be developed, and they also serve as a planning tool for information systems and help direct the efforts of business organizations towards developing and using strategic plans In identifying the critical issues accompanying the implementation of plans and directing the resources that are under the authority of managers towards important areas (Al-Zoubi, 2005; Alzoubi et al., 2021a).

Information system refers to a system for converting inputs or data from internal and external sources into information and communicating this information to managers at all organizational levels, and at all functions to enable and support managers in making successful and effective decisions in a timely manner to plan, direct and control the activities for which they are responsible (Esmeray, 2016; Svoboda et al., 2021).

Researchers and those interested in the field of strategic information systems agreed that this system represents the most important and main source for improving business competitiveness in an era when information and knowledge has become the most important, basic and decisive economic resource to ensure growth, survival and prosperity in the business environment, and understanding the competitive environment with its variables, dimensions and movement is the main premise and the basis for building, developing, enhancing and sustaining competitive advantage.

The strategic information system makes a substantial contribution to achieving this goal only when this system achieves strategic harmony and integration with other business resources, specifically the organization's strategy and infrastructure (Alzoubi et al., 2021b; Tariq et al., 2022). Obviously, the importance of any information system is determined by its output level, meaning the level of use, benefits, results, or achievements that result from, from this point of view, the importance of strategic information systems stems from the role of its outputs (strategic information) that the organization's strategic management needs to carry out its activities and activities efficiently and effectively, this information is of a special nature as that information necessary for making strategic decisions at the level of the organization (Masrek et al., 2009).

Researchers differed in defining a specific and agreed concept of critical success factors, as a result of differing opinions and viewpoints in addition to the difference

in the cognitive orientations of researchers, as (Syed et al., 2018) indicated that organizations that are interested in identifying critical success factors, this gives them the ability to develop its business, improving its competitive position, and achieving its planned organizational goals, since these factors represent important areas of focus, in addition to the fact that understanding these factors helps organizations to effectively confront risk situations, and thus enhances their ability to invest available opportunities in the future, and focus on identifying strengths and weaknesses in job.

Olszak and Ziemba (2012) believes that the critical success factors represent the processes, systems, and policies that organizations meticulously pursue to achieve a high and distinctive competitive position in the market and to adopt a certain type of mechanisms and methods that achieve success, growth and development for the organization as a competitive strategy and strategic position. Ranong and Phuenngam (2009) defined the critical success factors as the sum of results and the elements that help the organization to obtain effective and successful competitive performance, as there is a certain sequence of steps that must be followed to achieve the effectiveness and success of the organization, if the organization reaches unsatisfactory results, this indicates that there is a failure in the efforts made by the organization.

One of the main objectives achieved by the critical success factors is to adequately ensure the effectiveness and success of any organization, and to maintain a distinguished level of performance to implement its operations. Al-Abadi and Al-Atabi (2014) pointed out that the critical success factors are those vital factors and elements identified by the senior management for the success of the organization's strategic plan and the achievement of its goals, mission and distinction in the organization's internal and external environment.

Among the most prominent dimensions of the critical success factors for a strategic information system: **The commitment of senior management to support the strategic information system**, it has been described as representing the level of importance that management places on the successful completion of the information system, and in general, the commitment of senior management to support the strategic information system refers to the emotional or psychological commitment shown by senior management towards the information system. **Interaction between the beneficiaries of the strategic information system and its specialists**, It is represented in the level of coordination, communication, partnership and teamwork between the beneficiaries and specialists in the information system in terms of the amount and quality of communications and the exchange of ideas between them and the nature of the activities carried out by them. The beneficiaries and specialists must focus on the main objective of having a sound and effective strategic information system in order to interact appropriately. **The level of readiness of workers in the system**, it refers to the organization's ability through its employees to achieve successful adoption, use and benefit from information technology and systems (Fathian et al., 2018). **Users understand system requirements**, it is represented by the extent to which users understand the objectives, tasks and outputs of operations related to the information system, i.e. knowledge and comprehensive and integrated understanding in the field of information systems**.**

2.2 Human Resource Management Strategies

The idea of human resource management strategies in nomenclature and content was formed at the beginning of the nineties of the last century, basing its existence on the ideas that came from the Human Resources Management School; it did not cancel the previous ideas, but tried to add to it what could enhance its work at the present time. The directions of this new label for human resource management can be understood in the human resource management strategy by asking the following question: "How can coordination between human resource management activities and the organization's strategy?" (Al-Hawary & Alajmi, 2017).

Human resource management strategies are one of the most important elements of the success of the organization's strategies. It is not possible to find a strategy for an organization without including the human resource strategy, as goals can only be achieved through the human element as leaders or as subordinates in the organization (Jleida & Samir, 2018; Al-Hawary & Al-Hamwan, 2017; Al-Nady et al., 2013, 2016; Al-Hawary & Hadad, 2016). The strategy is defined as a set of procedures or behaviors that show how the organization will move from the activity in which it is currently working to the activity in which it hopes to work in the future, bearing in mind external opportunities and threats, and internal strengths and weaknesses (Dessler, 2015). From another point of view, the strategy is defined as a long-term plan taken by the organization as a base for making decisions based on its identification of its current and future mission. It is based on defining the range of products and markets it deals with, the uses of the resources available, the competitive advantage it enjoys, and the impact of compatibility between its various administrative functions and business activities, in order to achieve the organization's internal cohesion and enable it to move freely and adapt to what links it to its external environment and to reach its basic goals and objectives in a balanced manner (Alameeri et al., 2020; Alshurideh et al., 2019a, b; Schrager & Madansky, 2013).

The strategies of human resource management gain great importance through its contribution to the preparation and implementation of the organization's strategy, such as attracting experienced and competent workers, training and developing employees, motivating them and mobilizing their energies towards making more efforts and creativity to achieve the organization's goals and increasing its ability to gain opportunities and avoid environmental threats, as well as its ability to make optimal use of the organization's financial and material resources in line with the general strategic directions of the organization (Matei, 2013; Shah et al., 2020, 2021). The main objective of human resource management strategies is to attract creative human talents with experience and efficiency and try to take care of these talents and preserve them through their development, training, development, motivation and protection of their interests in order to achieve the ambitions and goals of the organization efficiently and effectively.

The researchers' viewpoints varied regarding the number of strategies that make up the human resource management strategy, as well as their nomenclature. Accordingly, the researcher decided to address the following strategies, which he looked at

in terms of their importance in the organization in which the study was applied and were as follows: **The recruitment strategy** is considered the most important among the human resource management strategies, as the construction and implementation of this strategy and the quality of the human resources employed result in the rest of the organization's functions, and thus the quality of the organization's performance as a whole (Al-Hawary & Nusair, 2017; Lee et al., 2022a, b). **Training and development strategy** refers to the administrative and organizational efforts related to the state of continuity aimed at making a modification in skills, behavior and knowledge within the current or future characteristics of the employee in order to be able to meet the requirements of his work or to better develop his practical performance in order to achieve the goals of the organization (Al-Hawary, 2011; Alshraideh et al., 2017). The **performance evaluation strategy** is defined as the organized description of the strengths and weaknesses associated with the job, whether collectively or individually, and serves two main purposes in the organization: providing managers and workers with the information necessary for decision-making, and improving and developing the performance of employees, which is positively reflected on the performance of the organization (Al-Hawary & Abu-Laimon, 2013; Al-Hawary et al., 2013; Lim et al, 2017). **Compensation strategy** is a system related to wages, rewards, incentives, and benefits that the organization provides to employees within certain bases in return for the employees' completion of their job tasks so that the compensation system is characterized by justice and equity and aims to attract human competencies and preserve human talents within the organization (Metabis & Al-Hawary, 2013; Mohammad et al., 2020).

2.3 Strategic Information Systems and Human Resource Management Strategies

Hammadi (2020) concluded that there is a relationship between human resource management strategies and strategic success in organizations, and that the information technology component of strategic information systems has a significant impact on competitive advantage. Holding training courses for new employees to qualify them in the field of practices related to the application of software because of their role in improving their efficiency and effectiveness. Al-Tayyar and Al-Nama (2018) emphasized that the inputs of strategic information systems and the sources of obtaining them, whether internal or external, are considered the main source of information used in making important decisions in the organization, as well as trying to reduce the difficulties facing the decision maker by using the strategic information system to provide the appropriate information to the decision maker when making strategic decisions, as well as using software to support the strategic decision (Youssef & Yahia, 2018).

That senior management adopts effective policies and vision in highlighting the role of critical success factors for information systems to achieve sustainable competitive advantage with the presence of environmental sensing. Al-Samarrai believes that there is a need for the company's management to invest in the strong positive relationship between the commitment of senior management to support the strategic information system and the effectiveness of the strategic decision to achieve more of this effectiveness and to make it more competitive. There is strong evidence that strategic information systems support and enhance the company's ability and flexibility to find competitive strategies in response to external environmental changes and that the effects of strategic information systems on the company's performance vary based on the competitive strategy. Accordingly, the study hypothesis can be formulated as follows.

There is a statistically significant effect of the critical success factors of the strategic information system in enhancing the strategies of human resources management in the Social Security Corporation.

3 Study Model

See Fig. 1.

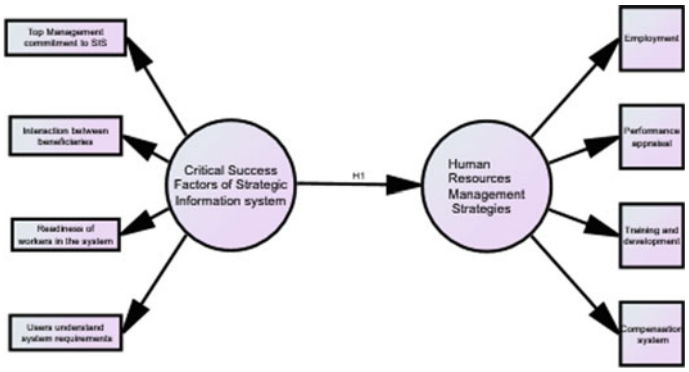

Fig. 1 Research model

4 Methodology

4.1 Population and Sample Selection

A quantitative method based on a questionnaire was used in this study for data collection and sample selection. The major aim of the study was to examine the impact of critical success factors of strategic information system on reinforcement of human resources management strategies in the Social Security Corporation. Data were primarily gathered through the questionnaires created by researchers which were distributed to a random sample of (165) respondent. In total, (145) responses were received including (25) invalid to statistical analysis due to uncompleted or inaccurate. Hence, the final sample contained (120) responses suitable to analysis requirements that were formed a response rate of (82.76%), where it proved to be sufficient to the extent that was predictable and allowed for a presumption of data saturation (Sekaran & Bougie, 2016).

4.2 Measurement Instrument

A questionnaire that consists of two main sections along with a section regarding control variables was used as the measurement instrument. Control variables considered as categorical measures were composed of gender, age, educational level, and experience. The two main sections were dealt with a five-point Likert scale (from 1 = strongly disagree to 5 = strongly agree). The first section contained (22) items to critical success factors of the strategic information system based on. These questions were distributed into dimensions as follows: five items dedicated for measuring Senior management commitment to support the strategic information system, six items dedicated for measuring Interaction between beneficiaries, five items dedicated for measuring readiness of workers in the system, and six items dedicated for measuring users understand system requirements. Whereas the second section included (20) items developed to measure human resource management strategies according to what was pointed by (Lim et al., 2017). This variable was divided into four dimensions: employment that was measured through five items, performance appraisal which measured by five items, training and development was measured using five items, and compensation systems that was measured by five items.

5 Findings

5.1 Measurement Model Evaluation

This study was conducted structural equation modeling (SEM) to test hypotheses, which represents a contemporary statistical technique for testing and estimating the relationship between factors and variables (Wang & Rhemtulla, 2021). Accordingly, the reliability and validity of the constructs were tested using confirmatory factor analysis (CFA) through the statistical program AMOSv26. Table 1 summarizes the results of convergent and discriminant validity, as well the indicators of reliability.

Table 1 shows that the standard loading values for the individual items were within the domain (0.573–0.654), these values greater than the minimum retention of the elements based on their standard loads (Sung et al., 2019). Average variance extracted (AVE) is a summary indicator of the convergent validity of constructs that must be above 0.50 (Howard, 2018). The results indicate that the AVE values were greater than 0.50 for all constructs, thus the used measurement model has an appropriate convergent validity. Rimkeviciene et al. (2017) suggested the comparison approach as a way to deal with discriminant validity assessment in covariance-based SEM. This approach is based on comparing the values of maximum shared variance (MSV) with the values of AVE, as well as comparing the values of square root of AVE ($\sqrt{}$AVE) with the correlation between the rest of the structures. The results show that the values of MSV were smaller than the values of AVE, and that the values of $\sqrt{}$AVE were higher than the correlation values among the rest of the constructs. Therefore, the measurement model used is characterized by discriminative validity. The internal consistency measured through Cronbach's Alpha coefficient (α) and compound reliability by McDonald's Omega coefficient (ω) was conducted as indicators to evaluate measurement model. The results listed in Table 1 demonstrated that both values of Cronbach's Alpha coefficient and McDonald's Omega coefficient were greater than 0.70, which is the lowest limit for judging on measurement reliability (de Leeuw et al., 2019).

5.2 Structural Model

The structural model illustrated no multicollinearity issue among predictor constructs because variance inflation factor (VIF) values are below the threshold of 5, as shown in Table 1 (Hair et al., 2017). This result is supported by the values of model fit indices shown in Fig. 1 (Fig. 2).

The results in Fig. 1 indicated that the chi-square to degrees of freedom (CMIN/DF) was 2.133, which is less than 3 the upper limit of this indicator. The values of the goodness of fit index (GFI), the comparative fit index (CFI), and the Tucker-Lewis index (TLI) were upper than the minimum accepted threshold of 0.90.

Table 1 Results of validity and reliability tests

Constructs	1	2	3	4	5	6	7	8
1. TMC	**0.702**							
2. IBB	0.557	**0.719**						
3. RWS	0.582	0.588	**0.752**					
4. UUSR	0.533	0.561	0552	**0.754**				
5. E	0.754	0.622	0.576	0.693	**0.788**			
6. TD	0.719	0.678	0.695	0.627	0.799	**0.711**		
7. PA	0.622	0.679	0.684	0.744	0.637	0.641	**0.694**	
8. CS	0.655	0.621	0.608	0.639	0.595	0.622	0.671	**0.799**
VIF	2.727	2.906	2.171	3.374	–	–	–	–
Loadings range	0.573–0.654	0.701–0.792	0.751–0.836	0.796–0.832	0.716–0.826	0.796–0.872	0.796–0.869	0.810–0.899
AVE	0.863	0.847	0.838	0.898	0.886	0.826	0.0.858	0.835
MSV	0.544	0.502	0.513	0.511	0.516	0.513	0.488	0.522
Internal consistency	0.847	0.832	0.875	0.895	0.844	0.911	0.864	0.873
Composite reliability	0.887	0.891	0.893	0.915	0.892	0.902	0.879	0.856

Note DPRO: digital promotion, DPRI: digital pricing, ATTR: attraction, MADB: marketing database, PERC: perception, INFL: influence, MOTI: motivation, DESI: desire, bold fonts in the table indicate to root square of AVE

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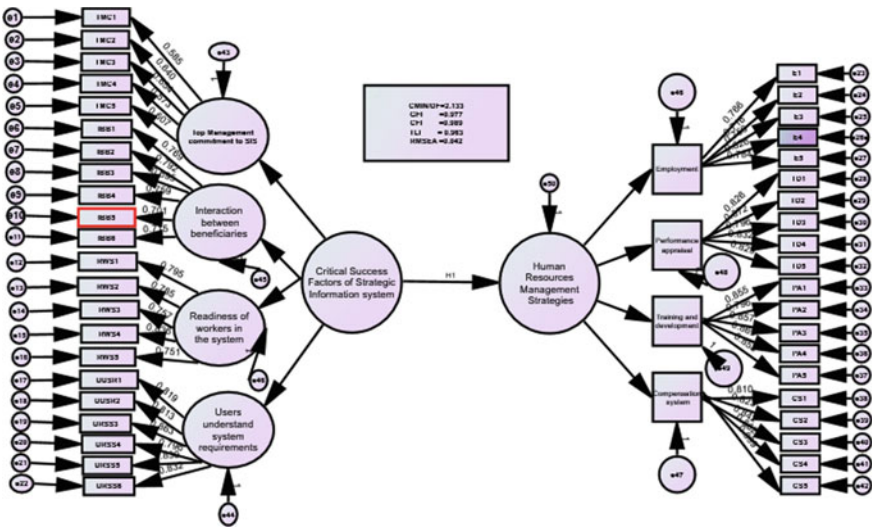

Fig. 2 SEM results of the digital marketing effect on mental image

Moreover, the result of root mean square error of approximation (RMSEA) indicated to value 0.049, this value is a reasonable error of approximation because it is less than the higher limit of 0.08. Consequently, the structural model used in this study was recognized as a fit model for predicting the DEP and generalization of its result (Ahmad et al., 2016; Shi et al., 2019). To verify the results of testing the study hypotheses, structural equation modeling (SEM) was used, the results of which are listed in Table 2.

The results demonstrated in Table 2 show that all critical success factors of the strategic information system dimensions have a positive impact relationship on human resources management strategies except Top management commitment to

Table 2 Hypothesis testing

Hypothesis	Relation	Standard Beta	*t* value	*p* value
H1	Top management commitment to support the strategic information system → human resources management strategies	0.084	1.041	0.300
H2	Interaction between the beneficiaries of the strategic information system → human resources management strategies	0.246	3.260	0.001
H3	The level of readiness of workers in the system → human resources management strategies	0.272	3.411	0.001
H4	Users understand system requirements → human resources management strategies	0.352	3.921	0.000

Note * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

support the strategic information system which has no impact on human resources management strategies ($\beta = 0.084$, $t = 1.041$, $p = 0.300$). However, the results indicated that the highest impact was for combination ($\beta = 0.352$, $t = 3.921$, $p = 0.000$), followed by socialization ($\beta = 0.272$, $t = 3.411$, $p = 0.001$), and finally the lowest impact was for internalization ($\beta = 0.246$, $t = 3.260$, $p = 0.001$).

6 Discussion

The results concluded that the Social Security Corporation adopts the critical success factors of the strategic information system, which are the interaction between the beneficiaries of the strategic information system and its specialists, the level of readiness of workers in the system, and the users' understanding of the system's requirements, it enhances the organization's management's interest in these factors because of their impact on the management of the organization's business from the strategic side, especially in the aspects of interaction between users and users' understanding of the aspects and operations of the information system, as well as the level of readiness of workers in the system to work. The critical success factors of the strategic information system enable the Social Security Corporation to practice recruitment activities (recruitment and appointment) in the various departments of the Human Resources Department and in a manner that enhances the possibility of creating databases that serve these activities and in a manner that enhances the possibility of obtaining the highest competencies and in order to achieve the strategic objectives of the Social Security Corporation**.**

The results confirmed that the management of the Social Security Corporation considers the interaction activities between the beneficiaries of the strategic information system and its specialists, and the level of readiness of the workers in the system from the normal routine activities in the institution and not from the strategic activities at the level of the Social Security Corporation. In addition, the Social Security Corporation exercises its internal tasks and operations with the aspects related to the performance evaluation strategy and related to the keenness of these leaders to give the process of evaluating the performance of workers great importance as it contributes to spreading the spirit of competition among workers and uses the results of performance evaluation to determine the training needs in the Social Security Corporation and to determine promotions And bonuses, and follow-up on the performance of employees by comparing the previous performance with the current performance at the level of departments and sections in the Social Security Corporation.

The results showed that the Social Security Corporation exercises its internal functions and operations in the aspects related to the compensation systems strategy in a tight manner through information systems and linking it to the performance evaluation and training strategy related to the keenness of these leaders to give the compensation systems strategy great importance as it contributes to formulating and

determining the strategy of wages, rewards and compensation that achieves satisfaction**,** and the use of this strategy in determining the levels of workers' achievement of their tasks in a way that qualifies them to determine the type of reward, in addition to the Social Security Corporation's reliance on the information provided by the performance appraisal system to determine the rewards and incentives that outstanding workers deserve, in addition to the Social Security Corporation conducting continuous wage surveys And salaries for the purpose of linking them to the cost of living.

7 Recommendations

Based on the previous results, the researchers recommend the need for the management of the General Organization for Social Security to pay attention to the commitment of the senior management to support the strategic information system, as it represents one of the critical success factors for the strategic information system. The study recommends that leaders in the organization strengthen the performance evaluation strategy because of its impact on enhancing many activities related to human resource management and linking them to strategic information systems to benefit from them in activating electronically and increasing the speed in making strategic decisions, and the need for the institution to pay attention to the recruitment strategy because of its reflection in attracting and employing competencies from human resources and working to link them electronically in terms of recruitment and models, leading to appointment in vacant positions in the institution.

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Factors Affecting Local Employees Sectorial Choice (Public vs Private), the Case of Abu Dhabi, UAE

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Abstract The purpose of this research study was to explore the factors that affect emirates employee sectorial choice (public vs private). And, to examine if there is a difference between these factors related to local employees working in the public sector and the private sector. A quantitative approach was deployed in this study to determine the most important factors that affect local employees' career choice

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_49

toward the private sector. The population of this study was the work force in the state of Abu Dhabi, those whom are employed in the public sector and in the private sector. Simple random sampling technique used to choose appropriate sample from this population. From each sector a random sample has been chosen from different industry that falls under the public sector and the same procedure has been followed for the private sector. The statistical tool used for the purpose of this study was Chi-square. Chi-square analysis is used to check for differences in the categories between the two samples. This study reveals the difference between public sector employees and private sector employees and their job characteristics. The public sector employees experience more autonomy and feedback than their colleague in the private sector. The study provided practical and theoretical recommendations.

Keywords Local employees · Sectorial choice · Abu Dhabi · UAE

1 Introduction

Career choice is considered the most important decision job seekers face. Choosing a career is not an easy decision, as this decision will affect their satisfaction, motivation, turnover, earnings, and productivity (Gagné & Deci, 2005; Alameeri et al., 2020; Allozi et al., 2022). In contrast, choosing the right career will increase productivity, and reduce turnover, and job burnout (Al Kurdi et al., 2020a, b). In this regard many theories were established to explain how people make their career choice. For example, Holland theory of vocational types, Super's developmental self-concept theory, Roe's personality theory of career choice (Osipow & Fitzgerald, 1996), social cognitive career theory (Brown, 2002), and the theory of planned behavior (Ajzen, 1991) provide an explanations of how people chose their career from different perspectives (sociological, personality, self-concept…etc.).

Switching between careers is sometimes considered an easy decision to make, but sometimes it is a difficult decision, especially when the opportunity to find another job is limited and competitive (Al Kurdi et al., 2021; Hansen, 2012; Hayajneh et al., 2021). In the Middle East area in general, and in the Gulf region specifically, job seekers prefer to work for the government (Al-Waqfi & Forstenlechner, 2012). United Arab Emirates is one such country in the Gulf region with employment rates that reveal high rates of people who prefer to work for government. According to Aldhaheri et al. (2017) in the United Arab Emiratis the employment rate in the government for locals is 89%, while only 11% are working in the private sector. Many factors affect employee's career choice. A number of studies have shown that many factors affect employee preferences for career and sector (private or public), factors such as job motivations, job characteristics, social influence (Albugamy, 2014; AlShehhi et al., 2020) and employer branding (Moroko & Uncles, 2008).

The private sector in the United Arab Emirate is currently suffering a shortage of Emiratis employees (Al-Waqfi & Forstenlechner, 2012). The majority of Emiratis target public sector as their preferred employment destination (Aldhaheriet al., 2017).

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Local job seekers in this country prefer to stay in unemployment pool for years to get a job in the public sector rather than starting immediate job in the private sector. The future policy of the country is to minimize dependence on oil as the main source of income, and finding other sources of income, such as depend on the service and production sectors.

This study is considered the first quantitative large-scale testing research for Emirates employment sectorial choice and the factors affecting their career choice preferences toward the private sector versus the public sector. Al-Waqfi and Forstenlechner (2012) in their research paper highlighted the need for quantitative research on local's job seekers in United Arab Emirates. Research also needed to explore external factors for job seekers career choice (Aldhaheri et al., 2017). The research added to the body of knowledge in career choice by examining job motivations, job characteristics, employer branding, and social influence. In addition, this study fills the gap in the literature that largely ignored the differences between the public sector employees and the private sector employees regarding their sectorial choice.

2 Theoretical Framework and Hypotheses Development

2.1 Career Choice

Career choice is considered a very critical and complex decision for each human being (Alshurideh, 2016; Alshurideh et al., 2015a). The stage in person's life in which he/she will transfer from dependent to independent person, where people think about their future and what they want to be (Alshurideh, 2019; Alshurideh et al., 2015b). A number of studies have shown that many factors affect employee preferences for career and sector (private or public), factors such as job motivations, job characteristics, social influence (Albugamy, 2014; Almazrouei et al., 2020; Alshurideh et al., 2019) and employer branding (Moroko & Uncles, 2008).

2.2 Factors Affect Employee Preferences for Career and Sector

Job Motivations: Motivations are considered an important factor for employees; when employee gets motivated, he/she will be able to do his job in more efficient and in effective manner. Job motivation (Al-bawaia et al., 2022; Alshurideh, 2022; Ammari et al., 2017). According to George and Jones (2012, p. 157) "can be defined as the psychological forces within a person that determine the direction of that person's behavior in an organization, effort level, and persistence in the face of obstacles". The differences in motivation between public and private sector employees have been discussed in many research articles (Al Shebli et al., 2021; Al-Hawary, 2015;

Al-Hawary & Abu-Laimon, 2013; Al-Hawary et al., 2020). Many of these studies focused on two different types of motivations, intrinsic and extrinsic motivations (Al-Hawary & Al-Namlan, 2018; Al-Hawary et al., 2013; Bettayeb et al., 2020; Metabis & Al-Hawary, 2013; Rashid & Rashid, 2012). According to Rayn and Deci (2000, p. 55) " *intrinsic motivations*, which refers to doing something because it is inherently interesting and enjoyable, and *extrinsic motivations,* which refers to doing something because it leads to a separable outcome". Thomas (2009) in his book indicated four types of intrinsic rewards or motivation; the four main intrinsic rewards are: sense of meaningfulness, a sense of choice, a sense of competence, and a sense of progress. Other studies indicated different types of extrinsic motivations, such as financial rewards (Al-Hawary, 2011; Al-Hawary & Nusair, 2017; Ng et al., 2016) prestige (Ng et al., 2016), pay (Lewis & Frank, 2002; Al-Lozi et al., 2018; Al-Hawary & Alajmi, 2017; Al-Hawary et al., 2020; Mohammad et al., 2020). Similar to Ng et al. (2016) and Dur and Zoutenbier (2015) found out that intrinsic motivations for public sector employees are stronger than private sector employees. However, Dur and Zoutenbier (2015) stated that altruism and laziness are more prevalent in the behavior of public sector employees. Extrinsic and intrinsic motivations were considered very important for both employees (public and private sectors); still, public employees' value extrinsic motivations more than private sector employees (Maidani, 1991).

DeSantis and Durst (1996) and Alsuwaidi et al. (2020) found out that pay is considered very important factor for choosing between public and private sector, especially between young employees, which prefer the private sector. Dan (2015) found out that there are no differences between employee benefits and the sectorial choice. Public sector employees were less concerned about financial rewards than private sector employees (Alshurideh et al., 2014; Rashid & Rashid, 2012). In contrast, Lewis and Frank (2002) argued that employees prefer the public sector because of the high security. Based on the above literature, the study hypotheses can be formulated as:

H1: There is a difference between extrinsic motivations and employee sectorial choice (Public vs Private).

H2: There is a difference between intrinsic motivations and employee sectorial choice (Public vs Private).

Job Characteristics: A job characteristic is considered a very important factor as it has many effects on work related outcomes. The job characteristics theory (JCT) developed by Hackman and Oldham (Faturochman, 2016) is widely used as a framework to study how particular job characteristics impact job outcomes, including job satisfaction. According to (Faturochman, 2016, p. 9) "job characteristics theory describes the relationship between job characteristics and individual response to work". The theory states that there is five core job characteristics: (a) skill variety, (b) task identity, (c) task significance, (d) autonomy, and (e) job feedback (Faturochman, 2016). Many studies linked job characteristic with organization performance, but few studies focused on the relationship between job characteristics and the employment sector.

DeSantis and Durst (1996) found out that employees in both sectors are concerned with a pleasant work atmosphere, friendly work environment, and job that are important for them and for the society. Solomon (1986) argued that some job characteristics that promote efficiency were more prevalent for the private sector employees. Lewis and Frank (2002) found out that job security considered very important characteristics, and employees who value job security will be more likely to work for the public sector. Based on the above literature, the study hypotheses can be formulated as:

H3: There is a difference between job characteristic and employee sectorial choice (Public vs Private).

Social Influence on Career Choice: Social influence plays a major role for job seekers in their decision for the career path. Studies indicted many social factors that affect job seekers career chose, factors such as, family, friends, and peers (AlHamad et al., 2022; Alkalha et al., 2012; Alshurideh et al., 2022; Alzoubi et al., 2020). Kulkarni and Nithyanand (2013) examined why social influence is considered a key factors in job choice decision for young job seekers. Kulkarni and Nithyanand indicated that there are two reasons on how social influence affects the decision of job seekers. The First reason was the pressure from their family. The second reason was to show their worth for their peer group, they want to be seen equal to their peers at work not want to be looked down upon.

In addition, Mishkin et al. (2016) studied career choice among women from the perspective of the theory of planned behavior. Based upon the theory of planned behavior, the researchers studied the effect of attitudes, subjective norms, and perceived behavioral control and their impact on career choice. Mishkin et al. stated that subjective norms; which are considered a social factor that explain how a person changes his/her behavior based upon the social pressure, was the most significant factor that affect women's career choice.

Further, Mishkin et al. (2016) investigated the role of role model on student's career choice. Both of these factors (subjective norms and role model) were positively affected students career choice (Mishkin et al., 2016). In similar study, (Korkmaz, 2015) investigated the social factors affecting student's career choice in science and technology. Korkmaz indicated that there was strong impact for father and mother on student career choice. In the same manner, Law and Arthur (2003) investigated the factors affecting school student career choice toward nursing as profession. Law and Arthur found out that parents, social career masters, and friends significantly affected their career choice. Based on the above literature, the study hypotheses can be formulated as:

H4: There is a difference between social influence and employee sectorial choice (Public vs Private).

Employer Branding and Job Seekers Career Choice: Private organizations conduct their business in a competitive environment. Competition between organizations has many forms. There is a competition on resources, technology, suppliers, human capital…etc. Attracting the most talent human capital is primary concern of the employer. This will enhance the fit between organization and people, which will

contribute to the strategic goals of organizations (Wallace et al., 2014). According to Wallace et al. (2014) employer branding can be defined as "the package of functional, economic, and psychological benefits provided by employment, and identified with the employing company" (p. 21). Moroko and Uncles (2008) attempt to provide characteristics of successful employer brand. There are two characteristics of successful employer brand. First, attractiveness and accuracy, which mean, that employee can assure an employer to be attractive if he supports awareness, differentiation, and relevance. Secondly, employees consider the employer brand successful if he supports consistency; in which there are a consistency between employer brand and employer experience, and organization culture and value (Moroko & Uncles, 2008).

Looking to employer brand from the perspective of potential employee, Jain and Bhatt (2015) pointed out the importance of understanding potential employees' perspective about employer brand. Jain and Bhatt declared that potential employees are willing to work for the employer if they perceived his brand to support company stability, work-life balance, and job security. Based on the above literature, the study hypotheses can be formulated as:

H5: There is a difference between employer branding and employee sectorial choice (Public vs Private).

3 Study Model

See Fig. 1.

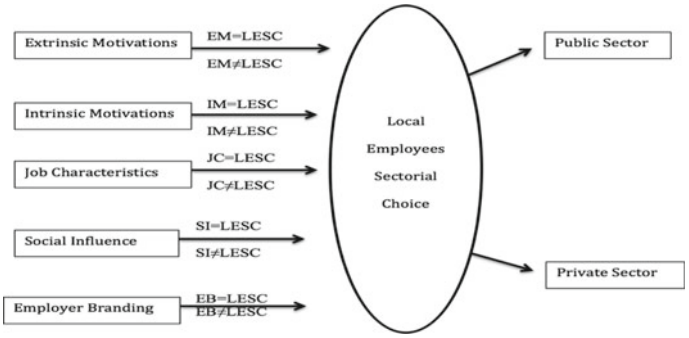

Fig. 1 Career choice conceptual model

4 Research Methodology

This is an exploratory study in which, it investigated and explored the factors that affect local employees career choice. A quantitative approach was deployed in this study to determine the most important factors that affect local employees career choice toward the private sector. The statistical tool used for the purpose of this study was Chi-square. Chi-square analysis is used to check for differences in the categories between the two samples.

4.1 Data Collection

The population of this study were the work force in the state of Abu Dhabi, those whom are employed in the public sector and in the private sector. Simple random sampling technique used to choose appropriate sample from this population. From each sector a random sample has been chosen from different industry that falls under the public sector and the same procedure has been followed for the private sector. Two samples were selected from both sectors (public and private), and a comparison between these two samples were conducted. The researcher deployed questionnaire to collect data from selected respondents, and five-point Likert Scale has been used to measure the variables.

4.2 Population

The population that concerns this study was the local employees working in United Arab Emirates, in specific, the state of Abu Dhabi. Employees working in the public and the private sector in the state of Abu Dhabi were considered the population of this study. Information about this population was gathered from Statistics Centre—Abu Dhabi (SCAD) and the Ministry of Human Resource and Emiratization (MHRE).

4.3 Sampling Frame and Sample

The method of simple random sampling was used to develop the sample of the research under discussion. This type of sampling is preferred when we are looking for a representative sample, it also allows for using statistical tests in data analysis (Neuman, 2006). Randomization in the sample helps the researcher in generalizing the results on the population, as it is free from bias and prejudice and it is a representative of the population. The researcher selects one sample from each sector (Public

Table 1 Questionnaire items obtained from the review of related literature

Construct	Author/s
Motivations (intrinsic and extrinsic)	Rashid and Rashid (2012), Dan (2015), Park and Word (2012), Lee and Wilkins (2011), Ko and Jun (2015)
Job characteristics	Johari and Yahya (2016), Faturochman (2016), Kim (2016)
Social influence	Pavel (2015), Eesley and Wang (2017), Al subait et al., (2017)
Employer branding	Jain and Bhatt (2015), Saini et al., (2015)

and Private), from different organization. Mostly, the industry under the investigation was from the service industry. The overall sample size was 344 respondents, 350 respondents from the public sector and 150 from the private sector.

4.4 Instrumentation

The questionnaire was developed upon reviewing the literature related to this dissertation. Table 1 represents the research constructs and the questionnaire items obtained from review of related literature by the researcher.

4.5 Validity

To assure the content validity the questions to be asked for the respondents supposed to cover all parts of the construct under investigation. Content validity should measure all elements of the construct and it involves three steps; identify of the content from the construct definition, from all the definitions chose a sample, and developing indicators that hit all of the parts of the construct definition (Neuman, 2006).

4.6 Reliability

For intrinsic and extrinsic work motivation, this part the researcher borrowed some questions from the work extrinsic and intrinsic motivation scale (WEIMS) developed by Deci and Ryan (Tremblay et al., 2009). The part of job characteristics was borrowed from Job characteristics inventory, developed by Hackman and Oldman (Faturochman, 2016). For employer branding the researcher borrowed some questions from the work of Tanwar and Prasad (Tanwar & Prasad, 2017). Finally, for

social influence scale the researcher borrowed some questions from the career influence inventory (Pavel, 2015). After conducting the pilot study, the Cronbach Alpha scores was 0.848 which indicates a strong reliability of the instrument.

5 Data Analysis

The aim of this research was to explore the differences between the public and the private sector employees in selecting their career sector. The statistical techniques employed to achieve this aim was Chi Square using SPSS (Statistical Package for Social Sciences). According to (Cooper & Schindler, 2014, p. 653) "chi-square ($\chi 2$) test is a test of significance used for nominal and ordinal measurements". Chi-square (χ 2) goodness-of-fit test to determine how closely observed frequencies or probabilities match expected frequencies or probabilities. It can be calculated for nominal, ordinal, interval, or ratio data (Leedy & Ormrod, 2013). This test used to determine whether a relationship observed in a contingency table is statistically significant (Christensen et al., 2011).

Hypothesis (1) was tested by five items (salary, working in prestigious organization, opportunity for career advancement, benefits, and job security). As it can be shown from Table 2, the table shows that all P-values for Chi-Square test are 0.001, and that is less than the established significant 0.05. Also, Table 1 shows that all Spearman Correlation are negative which indicate that the private sector employees are less extrinsically motivated than the public sector employees.

Overall, total extrinsic motivations combined have P-values for Chi-Square test is 0.001 and that is less than the established significant 0.05. Therefore, the hypothesis (H1) is supported. Correlation value equal (−0.608) this indicates strong negative relationship. We conclude that There is a significant difference between the public and the private sector employees regarding extrinsic motivation in favor to the public sector.

Table 2 Chi-square and Spearman correlation tests for extrinsic motivations

#	Item	Chi-square value	P-value	Spearman correlation
1	Salary	208.437	0.001	−0.753
2	Work in a prestigious organization	173.322	0.001	−0.640
3	Opportunity for career advancement (promotion)	32.916	0.001	−0.212
4	Benefits (health insurance, car, housing, bonus, leaves, etc.)	130.225	0.001	−0.593
5	Job security	218.865	0.001	−0.723
Total	Extrinsic motivations	654.404	0.001	−0.608

Table 3 Chi-square and Spearman correlation tests for intrinsic motivations

#	Item	Chi-square value	P-value	Spearman correlation
1	Interesting and challenging work	60.028	0.001	−0.368
2	Opportunity for personal growth and development (training, skills, languages, etc.)	30.296	0.001	−0.243
3	Sense of achievement	47.995	0.001	−0.349
4	Opportunity to serve the society	47.573	0.001	−0.337
5	I want to be a useful to the society	52.318	0.001	−0.344
Total	Intrinsic motivations	224.622	0.001	−0.308

This hypothesis (2) was tested by five items (interesting and challenging work, opportunity for personal growth and development, sense of achievement, opportunity to serve the society, useful to the society). Table 3 shows that all P-values for Chi-Square test are 0.001, and that is less than the established significant 0.05. Also, Table 3 shows that all Spearman Correlation are negative which indicate that the private sector employees are less intrinsically motivated than the public sector employees. Overall, total intrinsic motivations combined have P-values for Chi-Square test is 0.001 and that is less than the established significant 0.05. Therefore, the hypothesis (H2) is supported. Correlation value equal (−0.308) this indicates weak negative relationship. We conclude that there is a significant difference between the public and the private sector employees regarding extrinsic motivation in favor to the public sector.

Hypothesis (3) was tested by five items (the job requires a lot of cooperative work with other people, the job denies me any chance to use my personal initiative or judgment in carrying out the work, the job gives me considerable opportunity for independence and freedom in how I do the work, the supervisor and co-workers on this job almost never give me any feedback about how well I am doing in the work, supervisor often let me know how well they think I am performing the job, the job itself provides very few clues about whether or not I am performing well). Table 4 shows that all P-values for Chi-Square test are less than 0.05, and that is less than the established significant 0.05. Also, Table 4 shows that all Spearman Correlation except for item 2 are negative. The positive correlation for item 2 means that the private sector employees have more independent in performing their jobs.

Overall, total job characteristics combined have P-values for Chi-Square test is 0.001 and that is less than the established significant 0.05. Therefore, the hypothesis (H3) is supported. Correlation value equal (−0.037) this indicates very weak negative relationship. We conclude that there is a significant difference between the public and the private sector employees regarding job characteristics.

Hypothesis 4 was tested by five items (family, friends, and peers have a great impact on my decision, I believe on myself and he know what I want). As it can be

Table 4 Chi-square and Spearman correlation tests for job characteristics

#	Item	Chi-square value	P-value	Spearman correlation
1	The job requires a lot of cooperative work with other people	10.624	0.031	−0.162
2	The job denies me any chance to use my personal initiative or judgment in carrying out the work	54.135	0.001	0.220
3	The job gives me considerable opportunity for independence and freedom in how I do the work	104.587	0.001	−0.471
4	The supervisor and co-workers on this job almost never give me any feedback about how well I am doing in my work	20.383	0.001	−0.223
5	The job itself provides very few clues about whether or not I am performing well	15.804	0.001	−0.039
Total	Job characteristics	11.937	0.018	−0.037

shown from Table 5, the table shows that all P-values for Chi-Squair test are less than 0.05, and that is less than the established significant 0.05. Also, Table 5 shows that all Spearman Correlation are negative which indicate that the private sector employees are less affected by social influence than the public sector employees.

Overall, total social influence combined have P-values for Chi-Square test is 0.001 and that is less than the established significant 0.05 (see Appendices4). Therefore,

Table 5 Chi-square and Spearman correlation tests for social influence

#	Item	Chi-square value	P-value	Spearman correlation
1	My family has great impact on my decision (parents, spouse, siblings, children)	22.774	0.001	−0.243
2	My friends have great impact on my decision	18.212	0.001	−0.132
3	Peers have a great impact on my decision	12.489	0.014	−0.179
4	Professors and teachers in my university and school have great impact on my decision	23.989	0.001	−0.240
5	I believe on myself and I know what I want	13.840	0.008	−0.179
Total	Social Influence	66.052	0.00 1	−0.140

Table 6 Chi-square and Spearman correlation tests for employer branding

#	Item	Chi-square value	P-value	Spearman correlation
1	An employer reputation in the market for looking after and valuing employees	99.786	0.001	−0.450
2	Understanding the important of family or life outside the work	11.528	0.009	−0.181
3	Definitive and strong company values	56.045	0.001	−0.349
4	Flexible work hours	29.114	0.001	−0.187
5	Ethical practices	61.627	0.001	−0.405
Total	Employer brand	182.562	0.001	−0.309

the hypothesis (H4) is supported. Correlation value equal (−0.140) this indicates very week negative relationship. We conclude that there is a significant difference between the public and the private sector employees regarding social influence in favor to the public sector.

Hypothesis 5 was tested by five items (an employer reputation in the market for looking after and valuing employees, understanding the important of family or life outside the work, definitive and strong company values, flexible work hours, ethical practice). As it can be shown from Table 6, the table shows that all P-values for Chi-Square test are 0.001, and that is less than the established significant 0.05. Also, Table 6 shows that all Spearman Correlation are negative which indicate that the private sector employees have less employer brand practices than the public sector employees. Overall, total employer brand combined have P-values for Chi-Square test is 0.001 and that is less than the established significant 0.05. Therefore, the hypothesis (H5) is supported. Correlation value equal (−0.309) this indicates weak negative relationship. We conclude that There is a significant difference between the public and the private sector employees regarding employer branding in favor to the public sector.

6 Conclusions

The result of the study shows that there is a difference between public and private employees and sectorial choice (public vs private) for all hypothesis. The first variable in this study was extrinsic motivations. The first item measure extrinsic motivations was salary. In terms of salaries the public sector employees were very motivated by salary and they considered salary as the reason they choose this sector, in contrast private sector employees were not motivated by salaries and they did not considered salary as the reason they choose this sector. This result contradicts with previous studies (Rexhaj, 2011). The reason behind this contradiction is the salary gap between

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the public sector and the private sector, the gap can reach 5 times between the two sectors in favor for the public sector. As for work in prestigious organization the public sector employees see their organization as prestigious ones, and it was the reason they choose this sector. While, the employees in the private sector did not think this is the reason they choose this sector. This is due to the cultural perspective which connect salaries with prestige. The third item for measuring extrinsic motivation is opportunity for career advancement (promotion). The public sector employees were considering this item very important for them and affect their decision. In contrast, the private sector employees do not consider this item the reason behind their sectorial choice. This finding is not consistent with previous studies (Lee & Wilkins, 2011). The reason behind this result is that the private sector employees consider their job as a temporary one, and this will give them the experience to find a job in the public sector. Added to that, finally, the competition between locals on public jobs, especially with the increasing numbers of locals whom hold bachelor's degrees.

As for the benefits (health insurance, car, housing, bonus, leaves, etc.) and job security, both were considered very important for the public sector. The public sector employees considered these factors very important and affect their sectorial choice. In the contrary, the private sector employees did not consider these factors in their interest when it comes to sectorial choice. These finding contradicted with previous studies (Lee & Wilkins, 2011). The interpretation of why private sector employees feels unsecure and did not have benefits as their counterparts in the public sector is the hiring and firing policies practices followed by the private sector, and the absences of benefits in the private sector and the threat of expatriates. As stated by (Daleure, 2016), the researcher found out that job seekers prefer working in the public sector in UAE because they believe that the public sector had high salaries, better benefits and working conditions.

The second variable measured the difference between employee's sectorial choice was intrinsic motivations. For interesting and challenging work, public sector employees considered their work interesting and challenging while the private sector employees did not agree that their work is challenging and interesting. The reason behind this result is that the hiring polices imposed on the private sector and the employees themselves. Opportunity for personal growth and development shows a difference between employees in the public sector and employees in the private sector. This item was very important for public sector employees. In contrast the private sector employees did not consider this factor as a reason to work in the private sector. As discussed in the previous section private sector employees considered working in this sector as a temporary job, as soon as they get a job in the public sector they will leave immediately.

The third variable that measures sectorial choice between local employees in the public sector and employees in the private sector was job characteristics. For the purpose of this study, this variable measure job autonomy and job feedback, and it shows differences between employees' sectorial choice. The public sector employees have more job autonomy and receive feedback about their performance. In the contrary, the private sector employees have less autonomy in their job and receive

lees feedback about their performance. These finding is supported with previous study (Kim, 2016).

The fourth variable that measures sectorial choice between employees in the public sector and the private sector is social influence. All the factors that measure social influence are family, friends, peers, professors, and believe on oneself. For the public employees; family, friends, and believing in themselves, have strong impact on their decision toward the public sector. The same can be said for the private sector employees but with less impact. These finding confirmed with previous research (Mishkin et al., 2016, Workman, 2015; Ng, Burke, & Fiksenbaum, 2008). The finding can be explained due to the type of relationship between people and the culture of the Arab countries. Arab countries are considered a collectivistic societies base upon Hofstede cultural dimensions, individuals are embedded in groups with strong ties and loyalties and are expected to place collective interests over personal interests (Klasing, 2013).

The last variable that measures sectorial choice between the public and the private sector employees was employer brand. The results indicate differences between the two sectors regarding this variable. Public sector organizations are characterized by looking after and valuing their employees more than the private sector organizations. Also, organizations in both sectors appears to have an understanding of the important of life outside the work in favor to the public sector companies. Moreover, the public sector organizations have stronger company values than the private sector organizations (Daleure, 2016).

7 Implication

This study is considered the first point, this study is considered the first quantitative large-scale testing research for Emirates employment sectorial choice and the factors affecting their career choice preferences toward the private sector versus the public sector. The research added to the body of knowledge in career choice by examining job motivations, job characteristics, employer branding, and social influence. The second point of this study was to fill the gap in the literature that largely ignored the differences between the public sector employees and the private sector employees regarding their sectorial choice.

Two types of motivation were discussed in this study, extrinsic motivations and intrinsic motivations. The finding and conclusions of this study approved that there is a difference in the type of motivations that affect local employees decisions regarding sectorial choice. In general, prior studies showed that public sector employees are intrinsically motivated while private sector employees are extrinsically motivated.

The finding of this study somewhat surprising with prior studies, public sector employees considered both types of motives were the reason behind their sectorial choice decision. In contrast, private sector employees did not consider these factors as important as their counterpart in the public sector regarding their sectorial choice decision. This finding has important impactions for increasing the number of locals

in the private sector, by understanding their motives toward the private sector. Also, a review for the national program to encourage the employment of UAE nationals is needed. This program facilitates the employment of UAE nationals within specified occupations across the private sector.

In addition, this study reveals the difference between public sector employees and private sector employees and their job characteristics. The public sector employees experience more autonomy and feedback than their colleague in the private sector. An implication of this result is the possibility of the role of the human resources practice in these sectors. Furthermore, this study showed the impact of family and friends on employees sectorial choice decision. This finding may help us in understand the role played by the family and friends on the decision process. It also explains the weak role played by the educational system to deploy more locals in the private sector. Finally, one of the issues that emerged in this study was the difference between the two sectors in regard to employer branding. This finding has an important implication related to the private companies. These companies must shed the light on their image, and how to enhance this image to be more attractive for the locals as their desire sectorial choice.

8 Limitations

This study achieved its aim and its objective; however, it is not without limitations. It is difficult to generalize the finding of this study due to the industry that were willing to participate in this study (service industry only), and only three companies were participated in this study. Added to that, the study only covers one state from seven states in UAE (the state of Abu Dhabi).

Another limitation was the bureaucracy procedures to get the approval for collecting data from the government organizations. Even if the researcher inquired into general information that is supposed to be available to the public, the procedures were time consuming and the researcher's request was often rejected. Finally, as English is the second language for the researcher the process of developing this study was challenging for the researcher. In addition, the researcher did not have any idea about the academic writing style, it was challenging for the researcher.

9 Recommendations

This study provided practical and theoretical recommendations, the practical recommendations concern the leaders and decision makers about how to address this problem based on the results of this study. The theoretical recommendations concern the researchers and what further studies can be conducted based on the results of this study. Leaders and decision makers must focus on job security and the benefits that the private sector offer to the locals working in this sector. The study reveals a

fear from the locals working in the private sector regarding the continuity of their jobs and the fair benefits they deserve. Locals face a competition from expatriates, expatriates are willing to work more for less. Leaders and Decision makers must start to develop a pension and retirement plan that guarantee the rights of locals, to make the local feels more secure and protected from any prejudiced action from their companies. Leaders and decision makers must focus on the human resource practice and performance assessment in the private sector. The result of the study disclose that local employees have little autonomy and did not receive significant a feedback from their supervisors. As mentioned in the finding section, private companies must hire a specific number of locals in their companies.

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The Impact of Job Insecurity on Employees Job Performance Among Employees Working at Save the Children in Jordan

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Abstract This study aims to investigate the impact of job insecurity on job performance among employees of Save the Children Jordan. The population of this study is 254 employees of which 153 employees are the recommended sample size for Save the Children Jordan. In total (254) questionnaires were distributed to the target sample, of which (248) questionnaires were retrieved. The final number of valid questionnaires for analysis was (160). This study used a quantitative, descriptive statistics and other tools to test the study model. SEM analysis using PLS considering that present study has a sample of a small size relatively, therefore, it's vital to validate the garnered results using such SEM type. The findings in the study illustrated that job insecurity is negatively related to job performance. Base on the study results; Save the Children management is advised to provide more attention to Job insecurity issue among its employees and to find suitable means and apply adequate interventions to cope with this phenomenon and its consequences that expected to last for relatively a long period of time.

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_50

Keywords Job insecurity · Job performance · Save the children · Jordan

1 Introduction

In response to the devastating Syrian crisis and refugee's emergency situation, humanitarian work and relief has been booming recently in Jordan and the region where too many local and international Non-Governmental Organizations (NGOs) were established (Musa et al., 2014). One major focus of these NGOs is how to prepare their staff to respond to refugee needs with high quality services. However, since these NGOs are operationally based on donors' funding of certain projects, most of their staff gets recruited on project base, which means that by the end of the fund and the project duration the employees' contract is ended, and this creates a feeling of job insecurity which might negatively impact job performance.

Save the Children Jordan is one of those big NGOs operating in Jordan, especially when a merger took place between Save the Children Jordan office and international office to generate a big member with more than 300 staff and 600 volunteers. The merger includes a physical relocation, asset transfer, organizational restructuring and strategy refinement. These huge organizational changes expected to impact employees job insecurity level and thus their job performance at many local and international NGOs and specifically the case at Save the Children in Jordan.

Recently, job insecurity has become a very hot topic for researchers, being one of the most important stressors in working life (De Cuyper et al., 2008; Al Kurdi et al., 2020; Allozi et al., 2022) especially in the last 15 years, job insecurity researches has grown significantly (Lee et al., 2018). Due to the rivalry and market globalization, many organizations tend to achieve more adaptation to the market changes therefore

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more mergers, acquisitions and other organizational changes appear (AlTaweel & Al-Hawary, 2021, Al-Hawary & Al-Syasneh, 2020; Al-Hawary & Al-Hamwan, 2017; Hirsch & De Soucey, 2006), which are expected to put those organization's employees in doubt about their future careers. Job insecurity emerged as one of the most critical and alarming issues in contemporary organization, and has been studied among scholars and researchers (Sverke & Hellgren, 2002; Sverke et al., 2002).

Organizations try to improve the employees' performance adopting different approaches and measures (Allahow et al., 2018; Al-Nady et al., 2013; Mohammad et al., 2020; Alhalalmeh et al., 2020; Alolayyan et al., 2018; Alshurideh et al., 2017; Al-Hawary & Al-Kumait, 2017; Al-Hawary et al., 2011, 2013). However, few organizations including NGOs pay enough attention to the feeling of job insecurity among their employees and its impact on organizational outcomes, such as employees' satisfaction, turnover, productivity and overall performance. This might create subtle unwanted consequences including low levels of employee performance where employees' performance is vital and critical to the organizations' success and overall performance (Al Kurdi et al., 2021; Alameeri et al., 2020; Hayajneh et al., 2021). Managers and researchers have not fully realized the impact between these two important constructs. The present study aims to contribute to the understanding of the job insecurity–job performance relationship by contributing with additional perspective to the researchers' debate in the literature that claims different views for the relationship (AlShehhi et al., 2020; Alsuwaidi et al., 2020). Hence, most research on the effect of job insecurity on performance has so far reported mixed results (Al Shebliet al., 2021). This research contributes to support one view over the other. Since several studies covered the relationship between job insecurity and other variables, the researcher couldn't find big focus on the Job performance as a major dependent variable in the literature and it has received relatively little empirical attention in the literature as a consequence of job insecurity construct (Rosen et al., 2010; Al-bawaia et al., 2022). Even recent researchers, where tackling job performance among other outcomes with no focus on the direct Job Insecurity-Job performance relationship (Jiang & Lavayss, 2018). This can be considered as a second major contribution for this research. Therefore this study aims to investigate the impact of job insecurity on job performance.

2 Theoretical Framework and Hypotheses Development

2.1 Job Insecurity

Job security has been defined in the literature as the probability of an employee to keep his/her job. On the contrary, job insecurity is defined as the perception of a potential threat to continuity in his or her current job (De Witte, 2000; Probst, 2003). In growing societies, where companies need to keep up with the technological changes and the continuous demand, it is common to experience job security. In periods of

economic growth or expansion, organizations experience more demands and this in turn increases the amount of jobs available, and the probabilities of maintaining the actual employment thus job security will be prevalence. In contrast, when organizations experience loss of demand, they are forced to downsize thus job insecurity will be prevalence (Jimenez & Didona, 2017). On counterpart, some researchers argue that job insecurity is a common organizational phenomenon that does not necessarily comprise organizational changes, such as restructuring or downsizing, they reported in their studies that even in the same environment, employees could experience different levels of job insecurities (Huang et al., 2017).

Other researchers agreed that the global definition is best fit and has been most applied for organizations passed thru a crisis or change (De Witte, 1999). Whereas scholars who treat job insecurity as a multidimensional construct instead address not just job loss but also the loss of desired job features, certain dimensions or privileges in the job itself; such as opportunities for promotion, pay or other areas (Kurdi et al., 2020; Lee et al., 2006; Mauno et al., 2005). Researchers who adopt this multi-dimensional definition argue that job insecurity refers not only to the degree of uncertainty, but also to the components of job insecurity including: the severity of the threat concerning job continuity, the importance of the job feature to the individual, the perceived threat of the occurrence of a total negative effect on the job situation, the total importance of the changes and powerlessness and inability of the individuals to control the above mentioned factors.

2.2 Job Performance

Employees' performance defined as the quantity, quality, and timeliness to deliver an output with efficiency and effectiveness according to a pre-defined measure set by the supervisor or the organization (Al-Hawary & AlDafiri, 2017; Mathis & Jackson, 2009). Another definition Aguinis (2009) described performance as an employee perception on his behavior and to what extent it contributes to the organizational success rather than the real outcomes of their work. Quality and quantity of performance was defined as "a measure of how well the job was done" and "ratings of the quantity or volume of work produced," respectively (Viswesvaran et al., 1996). Primary studies often reported performance information from multiple sources, including objective assessment, supervisor ratings, and self-ratings.

2.3 Job Insecurity and Job Performance

As job insecurity may disturb performance at work, it becomes important for organizations to know the factors that might buffer the negative effects of job insecurity (Probst et al., 2018), being a potential moderator in the job insecurity-performance relationship (Sverke et al., 2006; Alshurideh, 2022). And since several studies

covered the relationship between job insecurity and other variables, the researcher couldn't find any focus on the Job performance as the major dependent variable in the literature (Jiang & Lavaysse, 2018).

The performance of employee will also get affected to the extent of feeling job insecurity (Alshraideh et al., 2017; Al-Dhuhouri et al., 2020; Ashal et al., 2021). Literature shows that there is an association between job insecurity and self-related performance (AlMehrzi et al., 2020). Moreover, studies also reveal that employees being afraid of job insecurity perform more to become valuable, in order to confirm their stay with organization. Other studies show negative relationship between job insecurity and well-being of employees, their attitudes, job involvement and trust over management (Alaali et al., 2021; Shoss, 2017; Sverke, et al., 2002).

It was clear in the literature that numerous studies have found negative relationship between job insecurity and job satisfaction, describing that an increase of job insecurity is associated to a decrease in job satisfaction (Reisel et al., 2010; Jiang & Probst, 2019). What is less clear in the literature is the relationship between job insecurity and performance, there is an evidence that job insecurity in some instances may leads to either increased or decreased levels of productivity or performance. Thus, a debate between researchers about job insecurity and job performance relationship raged. Although some researchers claimed that job insecurity negatively impact the job attitudes and then the performance, with the majority of studies considered that job insecure employees perform worse than job secure employees (Cheng & Chan, 2008). However, the counterpart researchers argued that job insecure employees are motivated to do necessary actions and extra effort to alter the risk of losing their jobs, as employees think that higher performing individuals are unlikely to be laid off, which implies the positive relationship between job insecurity and performance (Hartley et al., 1990). To investigate whether job insecurity might be a double effect factor or not, a recent research by (Lam et al., 2015) studied the relationship between job insecurity and organizational citizenship behavior (OCB). In his study he finds that as job insecurity increases from low to medium, OCB decreases and people deteriorate their social exchanges, and once job insecurity continues to increase, the employees become interested in OCB to impress their management thus enhance their chances of survival. Similar effects between job insecurity and self-reported job performance have also been reported by Selenko et al. Hence, these recent studies also suggest the need to continue examining potential moderators that might contribute to job insecurity and its associated performance. Based on the above literature the study hypotheses may be formulated as".

H1: Job insecurity will be a negative predictor for job performance among employees of Save the Children Jordan.

3 Methodology

This study used a quantitative, descriptive statistics and other tools to test a model that examined the effect of job insecurity on job performance among employees working at Save the Children in Jordan. Data were collected using self-administered questionnaire in regards to two main variables; job insecurity (the independent variable), job performance (the dependent variable) from employees working at Save the Children Jordan.

3.1 Population and Sampling

The population of this study is 254 employees of which 153 employees are the recommended sample size for Save the Children Jordan according to Sekaran (2003). However, due to the small population size it is preferable in this study to consider total population sampling to examine all Save the Children employees and avoid sample selection. This ensures that all concerns of this study will be better captured by the respondents. According to the above, 254 questioners is distributed to survey Job Insecurity especially after the unification, targeting different levels, positions, experiences, ages, genders, educational levels, salaries, etc. and focusing on certain geographical working areas where save the Children operating in (e.i. Zaatari camp, Azraq camp; and host communities in Amman, Irbid, Mafraq, Karak and Maan).

In total (254) questionnaires were distributed to the target sample, of which (248) questionnaires were retrieved. Hence, the response rate was (97%). Following that, validity of the questionnaire was checked for statistical analysis purposes, (88) questionnaires were deemed impropriate for further analysis due to inconsistent answers or consistent pattern through the entire questionnaire (either a low or high value on Likert scale). A number of reverse questions were added to enhance the robustness of the analysis and the findings. The exclusion rate of a 35% is perhaps due to participants' reluctance to provide factual data in judging the management behavior and decisions regarding downsizing and job security. Hence, the final number of valid questionnaires for analysis were (160). SPSS v.25 was used for data coding, using frequencies and means. The sample characteristics is summarized as:

Half of the sample were females (n = 79, 49.4%), this indicates good diversity in the sample gender. Majority of the sample were Jordanians (n = 148, 92.5%). The majority of the sample were relatively young and had aged less than 40 years (n = 119, 74%), with bachelor or higher education qualification (n = 114, 71%) among the sample, which is expected as Jordan classified with having one of the highest ratios of literacy among Middle East countries. Majority of the sample, had more than 5 years working in the humanitarian sector (n = 96, 60%), this is expected to allow for better understanding for the questionnaire items. Majority of the sample worked less than 5 years in Save the Children Jordan (n = 145, 69%) a sound of job insecurity is evident with a possibility of a high employees' turnover rate, thus the renewed contracts

seems to be conditioned with full commitment and high performance which fits the study design and concerns. In terms of the basic salary, about 40% of the workers in this organization are getting paid above 1,000 JOD which reflects the very good salary scale and the good packages this organization offer compared to other local organizations, especially during the difficult Jordanian economic situation. Majority of the sample were from Programs department (n = 92, 57.5%) which is in alignment with the organizational human capital distribution ratio (35% Support Departments; 65% Programs Department) and aligned with the Non-Governmental Organizations (NGOs) human capital normal distribution as these organizations scope of work is mainly based on programs implementation in the areas of deprivation. Hence, Job location reported that the majority of the sample were field based (n = 125, 78.1%) as some support jobs like: HR, Safety and Security, IT and logistics are also based in the to provide the programs with the necessary support.

3.2 Questionnaire Design

A survey questionnaire is used as an instrument with certain statistical tools to measure two variables, those designated to be used in this study. Through an extensive review of studies that used these variables, the researchers assessed reliability, validity, number of items, and the feasibility of each variable. These variables are:

1. **Job insecurity:** Job insecurity was measured in its global concept using De Witte (2000) scale which is a four items scale (2 items for cognitive job insecurity and 2 items for affective job insecurity). This scale was fruitfully employed in previous cross-cultural studies, exhibiting excellent validity and reliability of which it was the most used scale for job insecurity since 2003 (Lee et al., 2018). "Chances are, I will soon lose my job", "I am sure I can keep my job" (reverse coded), "I feel insecure about the future of my job", and "I think I might lose my job in the near future". Respondents were asked to rate these items on a 5-point Likert type scale, ranging from 1 ("strongly disagree") to 5 ("strongly agree"). It's worth mentioning that all previously mentioned different conceptualization of job insecurity in the literature have generated various measurement instruments for job insecurity (Huang et al., 2010). In a review for many empirical studies more than 10 different measures were adopted for job insecurity. Some studies use a single-item measure, asking if respondents perceive their jobs as insecure (e.g. Debus et al., 2012; Jiang & Probst, 2019); other studies rely on self-developed scales. Still the most frequently adopted measures are De Witte's (2000) four item scale, which appears in 46 studies conducted in Europe and Asia (Chiu et al., 2015). In the case of Save the Children Jordan, De Witte's (2000) Job Insecurity four item scale will be adopted as it is frequently used in studies on job insecurity and has a reasonably high reliability across different studies.
2. **Job Performance:** Job performance was measured using 29 items and as per a recent scale of which this particular one was developed in order to be useful in any

job-related context with a high probability of applicability worldwide (Carlos & Rodrigues, 2016). In Carlos & Rodrigues article they developed a job performance measure that was applicable across jobs and cultures after an extensive literature review and based on studies that were developed in different cultural and job-related contexts to end up with two main dimensions (task performance and contextual performance) and eight sub dimensions: job knowledge, organizational skills, efficiency, persistent effort, cooperation, organizational consciousness, personal characteristics and interpersonal and relational skills. Confirmatory factorial analysis was used in order to test their relevance. The dimensions 'personal characteristics' and 'persistent effort' were merged. The resulting 29 item scale presents appropriate psychometric properties. This scale has been selected for this research for its appropriateness and comprehensiveness for Job performance measurement. Both task performance and contextual performance has been measured as the follows: For Task Performance, 3 main items have been employed: 4 items in Job Knowledge, 5 items in Organizational skills, and 3 items under the efficiency. For Contextual Performance, 4 main items have been used: 5 items for Persistent effort, 3 items for the Cooperation, 5 items for Organizational conscientiousness and 4 items for Interpersonal and relational skills.

3.3 Data Normality

Skewness and Kurtosis values were examined to confirm normal distribution of the data. Kurtosis measure the extent to which data-tail is heavy or light in compare to normal distribution, and Skewness measure the extent to which data distribution differ from the normal distribution as suggested by (Sposito et al., 1983) who also suggested that Skewness and Kurtosis values should be within (+2) and (−2) range to confirm normality for SEM analysis purposes. Table 1 confirmed normality for study variables as Skewness recorded (−1.377) (−0.726) for job insecurity and job performance respectively, whereas Kurtosis recorded (1.719) and (−1.096) for job insecurity and job performance respectively.

Table 1 Skewness and kurtosis values for study variables (N = 160)

Construct	Skewness	Kurtosis
Job insecurity	−1.377	1.719
Job performance	−0.726	−1.096

Table 2 Summary of model fit indices

Indices	Cutoff criteria	Estimate	Interpretation
Chi-Square	–	387.818	–
NFI	>0.90	0.904	**Confirmed**
SRMR	<0.08	0.036	**Confirmed**

4 SEM Analysis Using SMART PLS

Recently, SMART PLS has emerged as a method of choice in different social sciences arena due its high capabilities in assessing complex models using regression-based ordinary least squares (OLS) estimation method with the goal of explaining the latent constructs variance by minimizing the error terms and maximizing the R^2 values of the endogenous constructs particularly with samples of small size (Hair et al., 2017), therefore, highlights SEM analysis using PLS considering that present study has a sample of a small size relatively, therefore, its vital to validate the garnered results using such SEM type.

4.1 SEM Analysis

Anderson and Gerbing (1988) suggested the use of two steps to complete SEM analysis, testing the measurement model using CFA and structural model testing.

Step 1: Measurement model & CFA:

The initial running of CFA reported poor model fit as (Hair et al., 2017) recommended values for model fit indices in variance structure analysis including Normed Fit Index (NFI) and Standardized Root Mean Residual (SRMR) to achieve good model fit. Therefore, number of items with low loading deleted from the model, as (Hair et al., 2017) recommended that items loading should exceed (0.70) to achieve good model fit. Following that (14) items were deleted from job performance construct and (1) item from job insecurity, and a sound of good model fit was achieved as summarized in Table 2. Table 3 summarizes deleted items.

After identifying final measurement model, statistical validity and reliability of the model need to be confirmed before proceeding with testing structural model.

4.2 Model Reliability

Reliability of the model was confirmed through Composite Reliability [CR] and Cronbach's α as suggested by Sekaran and Bougie (2016) and Hair et al. (2017). The recommended values for both criteria need to exceed (0.70) which was confirmed for present study variables as presented in Table 4.

Table 3 Deleted items from measurement model

Variable	Item
Job performance	Task_Perf_Knowledge_2
	Task_Perf_Knowledge_3
	Task_Perf_Skills_1
	Task_Perf_Skills_5
	Task_Perf_Efficiency_1
	Task_Perf_Efficiency_3
	Contex_Perf_1
	Contex_Perf_5
	Task_Perf_Cooperation_1
	Task_Perf_Cooperation_3
	Task_Perf_Conscient_2
	Task_Perf_Conscient_4
	Task_Perf_Interpersonal_3
	Task_Perf_Interpersonal_4
Job insecurity	Job_Insecurity_3

Table 4 Values of Cronbach α and Composite Reliability

Variable	Cronbach's α	CR
Job insecurity	0.805	0.807
Job performance	0.974	0.974

4.3 Model Validity

1. **Convergent validity:**

The majority of the model items load exceeded the recommended level (0.70) and significant at (0.05) level as (T) statistics of significance exceeded (1.96) as depicted in previous figure, therefore convergent validity was confirmed. Table 5 summarize final measurement model items loading and significance.

The second criterion to confirm convergent validity is the Average Variance Extracted (AVE), as Hair et al. (2017) suggested that AVE values should exceed (0.50) to confirm convergent validity of the model, which was confirmed in present study as summarizes in Table 6.

2. **Discriminant validity:**

PLS provides Fornell–Larcker criterion to confirm discriminant validity, which was confirmed for present study as presented in Table 7.

The final measurement model was confirmed, therefore its suitable to proceed with testing structural model.

Table 5 Loading and significance for final measurement model items

Variable	Item	Loading	(T)
Job insecurity	Job_Insecurity_1	0.863	20.452
	Job_Insecurity_2	0.867	15.019
	Job_Insecurity_4	0.813	13.349
Job performance	Task_Perf_Knowledge_1	0.893	65.212
	Task_Perf_Knowledge_4	0.854	40.488
	Task_Perf_Skills_2	0.866	49.486
	Task_Perf_Skills_3	0.883	50.365
	Task_Perf_Skills_4	0.835	32.420
	Task_Perf_Efficiency_2	0.852	32.869
	Contex_Perf_2	0.866	44.477
	Contex_Perf_3	0.847	32.926
	Contex_Perf_4	0.868	40.473
	Task_Perf_Cooperation_2	0.831	31.507
	Task_Perf_Conscient_1	0.782	20.009
	Task_Perf_Conscient_3	0.859	37.944
	Task_Perf_Conscient_5	0.832	27.231
	Task_Perf_Interpersonal_1	0.899	66.059
	Task_Perf_Interpersonal_2	0.859	38.323

Table 6 Values of AVE

Variable	AVE
Job insecurity	0.584
Job performance	0.713

Table 7 Fornell–Larcker discriminant validity

Variable	Job insecurity	Job performance	Locus of control
Job insecurity	**0.764**		
Job performance	−0.325	**0.844**	

Step 2: Structural model:

To test the proposed hypotheses, structural model needs to be tested. Testing structural model requires path testing through examining coefficient of determination (R^2) which represent the amount of variance that independent variable explain in the dependent variable, and path coefficient (β) that represent the influence of the variable and finally the significance of each path coefficient at (0.05) level through (T) statistics as suggested by Hair et al. (2017). Structural model that examine the

influence of job insecurity on job performance was tested, and result reported that job insecurity explained ($R^2 = 11\%$) of the variance in job performance, which indicate low variance, moreover, the influence was seen to be negative as ($\beta = -0.331$) and significant as ($T = 4.851$) which is evidently exceeding (1.96), therefore confirming the first hypothesis. See Figs. 1 and 2.

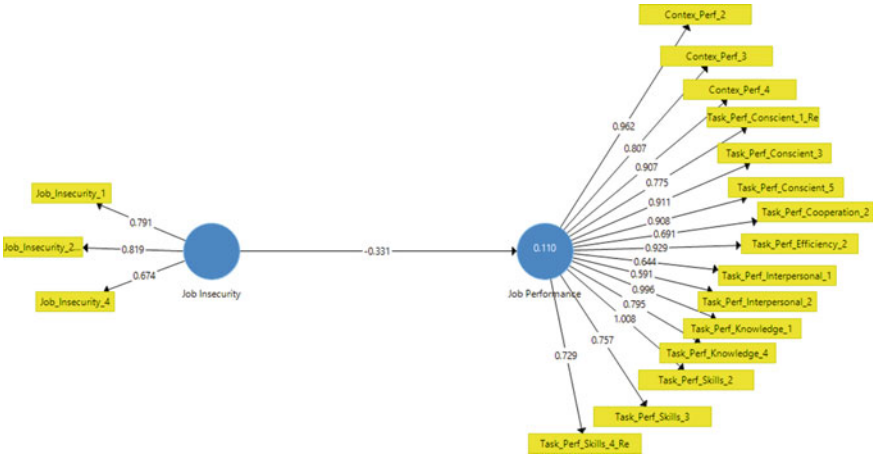

Fig. 1 Path testing for job insecurity as a predictor for job performance

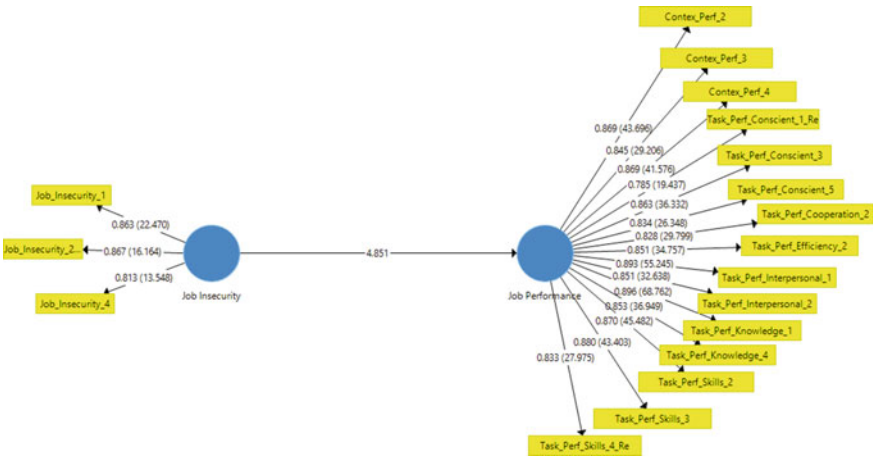

Fig. 2 Path significance for job insecurity as a predictor for job performance

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5 Discussion

The researchers intended to understand the relationship and the prediction power of job insecurity on job performance. The findings in the study illustrated that job insecurity is negatively related to job performance. According to the literature, most studies on job insecurity and job performance agreed to have a negative relationship between Job insecurity and Job Performance indicate that this finding is logical and expected. The conclusion of these studies is that individuals who experience high levels of job insecurity generally perform worse when compared with individuals who experience low levels of job insecurity (Cheng & Chan, 2008; Schreurs et al., 2012; James, 2012; Awan & Salam, 2014; Wang et al., 2015). Moreover, an interesting weekly diary study conducted in 2012 on the buffering role of social support in the relationship between Job Insecurity and Employee Performance showed that during weeks in which individuals felt insecure about their job, they performed worse in terms of meeting organizational objectives and fulfilling the requirements of their job. However, they found that this negative relationship is less pronounced when employees feel supported by their supervisor (moderator) (Schreurset al., 2012). Moreover, a recent study conducted in the Sultanate of Oman, concluded that there is a significant negative effect of job insecurity on employee performance (Sanyal et al., 2018). In such instance, all the above studies and findings support the view that job insecurity has a negative relationship with performance which is the case in this study.

However, the result in this study contradicts with some researchers who argued there is no significant negative association observed between job insecurity and performance. Berth stressed in his study that employees do not increase or decrease their discretionary efforts when experiencing job insecurity and he claimed that employees' motivation was a main reason to be unaffected by the external threat of organizational restructuring. Moreover, some other studies showed a positive and significant relationship between job insecurity and job performance or a positive but not significant relationship (Probst et al., 2007; Staufenbiel & König, 2010). Moreover, some other studies showed a positive and significant relationship between job insecurity and job performance or a positive but not significant relationship (Probst et al., 2007; Staufenbiel & König, 2010). According to the above, this study revealed the negative relationship between Job insecurity and Job Performance to contribute with one more vote to the side of the researchers stressed on the negative relationship between job insecurity and job performance among all the literature's argument.

6 Limitations of the Study and Direction for Future Research

Using self-administered survey which may allow for subjectivity although it is the most appropriate method that matches the study design. The study conducted for Save the Children Jordan office, thus considered as a case study with limitation for the generalizability of the findings and the results. Therefore Future research is needed to expand the population and to consider other NGOs in Jordan, for further validation, expanding acceptability, generalizability and applicability of this model. The conceptualization of job insecurity might be considered as a limitation. As we assessed only the core perception of job insecurity as the probability of losing the current job. Although using a reliable scale is an advantage however, some job insecurity measures are more differentiated and include additional aspects like the probability of losing valued job features, so it would be interesting to see whether these aspects have a similar correlational pattern or not. Future research is needed to investigate which individual factors (i.e. other personality traits) could have either a stronger or weaker moderation effect compared to LOC on the relationship between job insecurity and job performance in the presence of high job insecurity.

This study focuses on individual aspects in job insecurity and job performance, and did not include organizational aspects. However, organizational aspects such as organizational culture might influence the relationship between job insecurity and performance. Future research could also explore the generalizability to other cultures and countries. Such intercultural research should also try to explain the effect that studies from English speaking countries found relationships between job insecurity and performance that are double as high as in non-English speaking countries this could refer to the laws and regulations in every country as in some countries firing people could be legally difficult such as Germany. Future research could study how organizational factors such as culture, justice, commitment, etc. could affect the relationship between job insecurity and job performance.

7 Managerial Implications

Despite that this study revealed that Save the Children employees have a high level of performance, this high performance is expected to be a short term status as those employees are expected to leave the organization whenever they secure a better stable job which could impact the organization negatively with high turnover rate, loss of institutional memory, losing competent staff, high cost of recruitment and training, beside other implications. According to the literature, Save the Children management is advised to provide more attention to Job insecurity issue among its employees and to find suitable means and apply adequate interventions to cope with this phenomenon and its consequences that expected to last for relatively a long period of time. Management needs to listen to employees' concerns, increase

their participation in change-related decision making, and spend more time clearly explaining the aim of the changes using accurate and unbiased procedures. More focus on employees' long term contracts instead of the short term contracts to improve staff stability and job security. Human Resources Management in Save the Children need to ensure that new comers orientation program matches the skills needed in the workplace and may need to expand to areas that teach about moderating stressors at work environment such as job insecurity and having the abilities to achieve work goals, too.

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The Impact of Strategic Thinking on Performance of Non-Governmental Organizations in Jordan

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Abstract This study aimed to address the issue of strategic thinking at non-governmental organizations in Jordan & investigate whether strategic thinking has any impact on the performance of these organizations. It also aimed at finding out whether the top manager's demographic characteristics have moderating effects on the relationship between strategic thinking and organization performance. The study sample consisted of (262) top managers of non-governmental organizations in Jordan. The primary data of the study collected by questionnaire. SPSS, AMOS, and Smart PLS software utilized to conduct the statistical analysis process. The results show a positive impact of strategic thinking on the on performance. Furthermore, the

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_51

study will hopefully be beneficial for policymakers & all organizations interested in boosting the role of NGOs. This research recommends the organizations to promote and support the adoption of strategic thinking factors for NGO managers and related institutions to improve the level of performance and quality of services provided such as developing training programs specialized in strategic thinking topics and organizing training workshops to discuss the real cases and companies' experiences inside and outside Jordan.

Keywords Strategic thinking · Organization performance · Non-governmental organization

1 Introduction

Strategic thinking (ST) is a critical component in the strategic management literature (Altamony et al., 2012; Al-Hawary & Hadad, 2016). A combination of careful blending of alternative strategic approaches and the impact of different decisions on an organization's value-creating process is essential. ST entails maintaining perspective on an organization's overall approach and coordinating the multiple dimensions of a combination of strategy (Pisapia, 2009). Most organizations operate under extreme pressure to attain efficiency and effectiveness (AlTaweel & Al-Hawary, 2021; Al-Hawary & Al-Syasneh, 2020; Allahow et al., 2018; Al-Nady et al., 2013). Hence, strategic thinking is needed to show direction and adapt to the ever-evolving environmental challenges (Alshraideh et al., 2017; Alaali et al., 2021). Managers with strategic thinking acumen who can scan the salient ecological trends and events with maximum predictability must be of paramount importance to the successful change process that positively impacts organizational performance (Harzing & Ruysseveldt, 2004; Al-Dmour et al., 2021; Lee et al., 2022a, b).

Strategic management and strategic thinking involve a series of decisions that companies could make strategically in the process of developing an effective and long-lasting business strategy to succeed and compete well at the internal levels (Alhalalmeh et al., 2020; Al-Hawary et al., 2020; Alyammahi et al., 2020). A company often adopts strategic planning process through business documentation, team management, time management and effective utilization of HR resources to achieve their desired levels of productivity and business growth in comparison to their competitors (Al-Hawary & Al-Namlan, 2018; Al-Hawary et al., 2013a, ¾b; Al-Lozi et al., 2017, 2018). Companies strive hard to create a strategic thinking environment within the internal business culture to make creativity and innovation through strategic decision making in year around processes (Hamadneh et al., 2021; Odeh et al., 2021). Strategic thinking enhances the ability of the companies to think strategically and differently than routine business processes and to get competitive edge over their competitors by identifying emerging business opportunities (Kitonga et al., 2016).

Non-governmental organizations (NGOs) have grown enormously to the point where they are now involved with every aspect of humanitarian work and relief. One primary focus of NGOs is how to prepare their staff to respond to the needs of the beneficiaries from their services. According to AlNasser (2016), Jordan now has many NGOs that act on an international scale through communication, coordination, training, fund-raising, and project implementation. They work with different local and international organizations such as environmental communities, community centers, women's groups, cultural foundations, and IT circles, all in the common purpose of empowering women and youth as well as improving their chances in the future.

The research work on the importance of strategic thinking in the process of strategic planning through which companies can achieve desired business growth and success. It provides necessary direction and guidelines to the management of a company to think strategically about limited business resources and time and people who are important for a success of a business. Strategic thinking enhances the ability of a business to effectively utilize available resources and advance the company towards its business goals and objectives. The research indicates that strategic thinking has become essential for companies to adapt their business processes and operations according to changing business environment and market conditions. With the lack of research related to NGOs in Jordan and growing interest in strategic thinking, it is necessary to shed more light on this area. So, the present study aims to address the issue of strategic thinking at NGOs in Jordan and investigate whether strategic thinking has any impact on the performance of these organizations.

2 Theoretical Framework and Hypotheses Development

2.1 Strategic Thinking

Strategic thinking is seen as the generation and application of unique business ideas intended to create a competitive advantage for a firm or business (Hamel & Prahalad, 1994). According to Mahdavian et al. (2014), ST is a way of thinking that has an essential place in the modern world and plays an essential role in significant issues at different organizational levels. Several researchers of strategic management emphasize that ST is one of the capabilities of high- performing leaders and enables thinkers to discover opportunities & understanding of the past, present, and future of the organization in order to survive, grow and achieve competitive advantage (Obeidat et al., 2021; Shamout et al., 2022; Shirvani & Shojaie, 2011). Bonn (2005) emphasizes that ST provides thinking and future vision that can change the competing rules of organizations and stresses that strategic thinking has been identified by a panel of experts as one of the ten most critical areas for future management research. Leadership and strategy theorists also noted that strategic thinking is required at

multiple organizational levels; the need for thinking skills moves deeper at all levels of organizations (Ahmad et al., 2021; Alzoubi et al., 2022; Goldman & Casey, 2010).

Strategic thinking has many concepts. Porter (1991) states that ST is the glue that holds together the many systems and initiatives within the company, Mintzberg notes many practitioners and theorists have wrongly assumed that strategic planning, ST, and strategy making are all synonymous, at least in best practice. It is a matter of common sense to realize the existence and importance of strategic thinking as a concept. According to Horne and Wooton (2000), ST involves gathering information, formulating ideas, and planning action. Keelin and Arnold (2002) consider that the critical ability to be a strategic thinker is to have a strategic perspective and the ability to create clarity out of complex and disconnected details. Bonn (2005) defines ST as a way of solving strategic problems that combines a rational and convergent approach with creative and divergent thought processes. He argued that ST at the individual level consists of three main elements: systems thinking, creativity, and future vision. It can be seen from the above discussion that strategic thinking is conceptualized in different ways by different researchers. The present study adopts Bonn's (2005) definition, which includes three dimensions: systems thinking, creativity, and future vision.

Different models were proposed by strategic management thinkers to conceptualize ST. Bonn (2005) scrutinizes strategic thinking in three levels individual, group, and organization. On an individual level identifies three dimensions of ST: systems thinking, creativity, and future vision. He also concludes that competent decision-makers in strategic thinking have obtained more diverse conceptual systems than those who lack this capacity. Bonn believes that the role of strategic thinking is to try to innovate and envision a different future for the organization, which may lead to the redefinition of the company's primary or industrial strategies. Mintzberg (1998) argues that strategic thinking is a combination of looking backward, outlook, looking around, and completing it because he thinks that a real strategic thinker is the one who can connect all perspectives and visualize their cooperation in his mind. Kaufman et al. (2003) views Strategic thinking as a response to everyday problems. He argues that strategic thinking focuses on creating a better future by making the future and also on increasing value goals in society by obtaining profitable results. Kaufman et al. (2003) outlines six critical factors as success factors that chart strategic thinking. These factors are changing existing models and defining new broad lines of thinking, planning, activity, evaluation, and continuous improvement.

Many scholars seem to agree that the main dimensions of strategic thinking are Systems thinking, creativity, and having a future vision (Morrisey, 2004; Mintzberg, 1998; Kaufman et al., 2003; Bonn, 2005; Ashal et al., 2021). The present research also uses the same dimensions for strategic thinking. A brief description of each of these dimensions is provided in the following sections.

Systems thinking: Systems thinking is a way to see holistically. In other words, system thinking creates a conceptual framework to represent clearer models and makes clear how they are changed effectively, and it is formed based on a system viewpoint. A strategic thinker should always have a complete model of value creation factors and understand their collaboration well (Alameeri et al., 2020; Liedtka, 1998;

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Marquardt, 1996). System thinking sees a problem or an opportunity as a part of the whole situation or system (Senge, 1990; Liedtka, 1998; Bonn, 2005; Alzoubi et al., 2021).

Creativity: Creativity is another essential element of ST. In a rapidly changing competitive business world, strategy and creativity are not random phenomena. Many organizations are looking for ways to find new perspectives and think about products, markets, challenges, and opponents. It is necessary to combine creativity with a strategic thinking process that allows employees and organizations to utilize more effectively and leverage the power of their minds in the best way (Alsharari & Alshurideh, 2020; Bonn, 2005; Mintzberg, 1998). According to Amabile (2013) creativity disciplined work style and skills in generating ideas. These cognitive processes include the ability to use wide, flexible categories for synthesizing information and the ability to break out of perceptual and performance "scripts." The personality processes include self-discipline and a tolerance for ambiguity.

Future vision: The third element of ST has a future vision. The latest theories in the world of leadership emphasize the roles of leaders in arranging view choosing its content (Bonn, 2005). The view of an organization defines its way and direction, which helps the organization heightens its success. Some believe that the view is created while others believe that it exists but should be discovered. In any case, the organizational view consists of the process of creation (Collins & Porras, 1989; Nuseir et al., 2021). ST must be accompanied by a strong understanding of the ultimate goal and a positive vision of the future of the organization.

2.2 Organizational Performance

According to Zheng et al. (2010) organizational performance stimulation has always been a priority in all sectors since it is directly associated with the value creation of the entity. Organizations are continually striving for better results, influence, and competitive advantage. Evaluating the performance of the organization has always been of interest to management teams and researchers (Al Kurdi et al., 2020; Al-Hawary, 2011, 2015; Al-Hawary & Abu-Laimon, 2013; Al-Hawary et al., 2013a, 2013b). In this regard, some researchers focused on determining definitions and how to measure organizational performance. The term performance is used extensively in the field of business management, and it varies according to organization objective. According to Hamon (2003), performance is a set of appropriate standards that enable to provide judgment on activities results. Borman and Motowidlo (1997) identified two types of employee behavior that are necessary for organizational effectiveness: task performance and contextual performance. Task performance refers to behaviors that are directly involved in producing goods or services or activities that provide indirect support for the organization's core technical processes. On the other hand, contextual performance is defined as individual efforts that are not directly related to their primary task functions. However, these behaviors are essential because they

formulate the organizational, social, and psychological contexts (Wang et al., 2015; AlShehhi et al., 2020).

In the first decade of the twenty-first century, according to Robbins (2000) and Mouzas (2006), each of effectiveness and efficiency have their distinct meaning. Effectiveness focuses on achieving mission, goals, and vision, whereas efficiency relates to the optimal use of resources to achieve the desired output. Al-Hawary and Al-Syasneh (2020), argues that organizational performance should focus on the capability and ability of an organization to efficiently utilize the available resources to achieve accomplishments consistent with the set objectives of the company. Effectiveness oriented companies are concerned with output, quality, creation of value-added, innovation, and cost reduction. It measures the degree to which a business achieves its goals or the way outputs interact with the economic and social environment. Usually, effectiveness determines the policy objectives of the organization or the degree to which an organization realizes its own goals (Zheng et al., 2010; Al-Hawary, 2009; Al-Hawary & Mohammed, 2017; Al-Hawary & Nusair, 2017). Meyer and Herscovitch (2001) analyzed organizational effectiveness through organizational commitment. The workplace may take various forms, such as the relationship between leaders and staff, employee's identification with the organization, involvement in the decision-making process, psychological attachment felt by an individual.

According to Al-Hawary (2009), organizational effectiveness helps to assess the progress towards mission fulfillment and goal achievement. To improve organizational effectiveness, management should strive for better communication, interaction, leadership, direction, adaptability, and a positive environment. Pinprayong & Siengthai (2012) distinguishes between business efficiency & organizational efficiency. Business efficiency reveals the performance of input and output ratio, while organizational efficiency reflects the improvement of internal processes of the organization, such as organizational structure, culture, and community. Excellent organizational efficiency could improve entities' performance in terms of management, productivity, quality, and profitability. Therefore, management must ensure success in both areas.

In summary, effectiveness and efficiency are two essential dimensions of organizational performance. According to the researcher's best knowledge and based on the nature of the study population (non-profit organizations), effectiveness and efficiency are more suitable for the present research to measure organizational performance. In the other hand, strategic thinking associated with creativity and innovation to improve business performance and competitiveness of business; ST identified and revealed different strategic management approaches such as open-minded idea creation by mangers and enhanced learning within internal culture of the organizations. So, the organizations could success in developing a learning business environment within their business structure to succeed in the processes of strategic thinking to enhance innovation and creativity and uniqueness of ideas within the organization.

2.3 Strategic Thinking and Performance

Bonn (2005) showed that the development of strategies at the individual, community, and organization levels helps to develop the strategic thinking of organizations, which in turn helps to achieve organizational objectives. Jelenc and Swiercz (2010) explored the relationship between leader cognitive models of ST and the performance of Croatian firms. The results showed a positive relationship between leader cognitive models of ST and firm performance. Al-Qatamin and Esam (2018) addressed the effect of ST on the achievement of a competitive advantage. The Results showed that ST skills have a significant effect on competitive advantage. Moghadam et al. (2018) studied the impact of ST on innovation performance in Sistan and Baluchistan province customs administrations in Afghanistan. Results showed that all ST dimensions significantly influence innovation performance. Based on the literature review above studies, the study hypotheses can be formulated as:

There is a positive impact of strategic thinking on NGOs performance in Jordan

3 Research Model

As can be seen from the research model in Fig. 1, strategic thinking is the independent variable, and its dimensions are systems thinking, creativity, and future vision. These dimensions were adopted by well-known researchers in the field of strategic management (Morrisey, 2004; Mintzberg, 1998; Kaufman et al., 2003; Bonn, 2005). These dimensions/variables are hypothesized to affect the dependent variable (i.e., efficiency and effectiveness).

The model below represents the predicted association and relationships between strategic thinking represented by system thinking, creativity and future vision. Hence, strategic thinking is expected to impact organizational performance. Organization performance can be measured by two significant variables: efficiency and effectiveness.

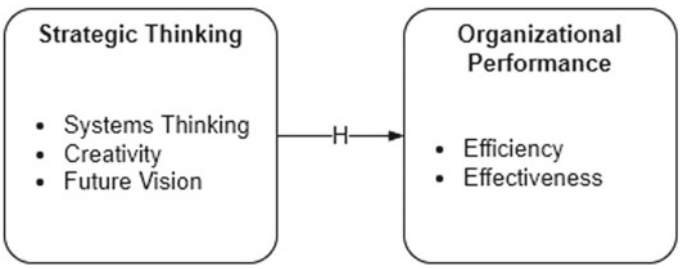

Fig. 1 Research model

4 Methodology

4.1 Population and Sample Selection

A qualitative method based on a questionnaire was used in this study for data collection and sample selection. The major aim of the study was to examine the impact of strategic thinking on organizational performance. Therefore, it focused on non-governmental organizations (NGOs) operating in Jordan. Data were primarily gathered through self-reported questionnaires creating by Google Forms which were distributed to (275) senior managers via email. In total, (263) responses were received including (6) invalid to statistical analysis due to uncompleted or inaccurate. Hence, the final sample contained (257) responses suitable to analysis requirements that were formed a response rate of (93.45%), where it proved to be sufficient to the extent that was predictable and allowed for a presumption of data saturation (Sekaran & Bougie, 2016).

4.2 Measurement Instrument

A self-reported questionnaire that consists of two main sections along with a section regarding control variables was used as the measurement instrument. Control variables considered as categorical measures were composed of gender, age group, educational level, and experience. The two main sections were dealt with a five-point Likert scale (from 1 = strongly disagree to 5 = strongly agree). The first section contained (14) items to measure strategic thinking based on (Alomari, 2020; Dixit et al., 2021). These questions were distributed into dimensions as follows: four items dedicated for measuring systems thinking, five items dedicated for measuring creativity, and five items dedicated for measuring future vision. Whereas the second section included nine items developed to measure organizational performance according to what was pointed by (Jami Pour & Asarian, 2019; Ling, 2019). These items divided into two dimensions: five items for measuring efficiency and four items for effectiveness.

5 Findings

5.1 Measurement Model Evaluation

This study was conducted structural equation modeling (SEM) to test hypotheses, which represents a contemporary statistical technique for testing and estimating the relationship between factors and variables (Wang & Rhemtulla, 2021). Accordingly, the reliability and validity of the constructs were tested using confirmatory factor

Table 1 Results of validity and reliability tests

Constructs	1	2	3	4	5
1. Systems thinking	**0.760**				
2. Creativity	0.428	**0.775**			
3. Future vision	0.337	0.384	**0.756**		
4. Efficiency	0.674	0.682	0.471	**0.779**	
5. Effectiveness	0.584	0.665	0.387	0.628	**0.745**
VIF	1.054	1.784	1.674	– -	– -
Loadings range	0.688–0.847	0.658–0.839	0.674–0.822	0.652–0.894	0.681–0.852
AVE	0.578	0.600	0.571	0.606	0.555
MSV	0.497	0.502	0.488	0.436	0.510
Internal consistency	0.842	0.880	0.865	0.854	0.858
Composite reliability	0.845	0.882	0.869	0.859	0.861

Note Bold fonts demonstrate the values of $\sqrt{}$AVE

analysis (CFA) through the statistical program AMOSv24. Table 1 summarizes the results of convergent and discriminant validity, as well the indicators of reliability.

Table 1 shows that the standard loading values for the individual items were within the domain (0.652–0.894), these values greater than the minimum retention of the elements based on their standard loads (Al-Lozi et al., 2018; Sung et al., 2019). Average variance extracted (AVE) is a summary indicator of the convergent validity of constructs that must be above 0.50 (Howard, 2018). The results indicate that the AVE values were greater than 0.50 for all constructs, thus the used measurement model has an appropriate convergent validity. Rimkeviciene et al. (2017) suggested the comparison approach as a way to deal with discriminant validity assessment in covariance-based SEM. This approach is based on comparing the values of maximum shared variance (MSV) with the values of AVE, as well as comparing the values of square root of AVE ($\sqrt{}$AVE) with the correlation between the rest of the structures. The results show that the values of MSV were smaller than the values of AVE, and that the values of $\sqrt{}$AVE were higher than the correlation values among the rest of the constructs. Therefore, the measurement model used is characterized by discriminative validity. The internal consistency measured through Cronbach's Alpha coefficient (α) and compound reliability by McDonald's Omega coefficient (ω) was conducted as indicators to evaluate measurement model. The results listed in Table 1 demonstrated that both values of Cronbach's Alpha coefficient and McDonald's Omega coefficient were greater than 0.70, which is the lowest limit for judging on measurement reliability (De Leeuw et al., 2019).

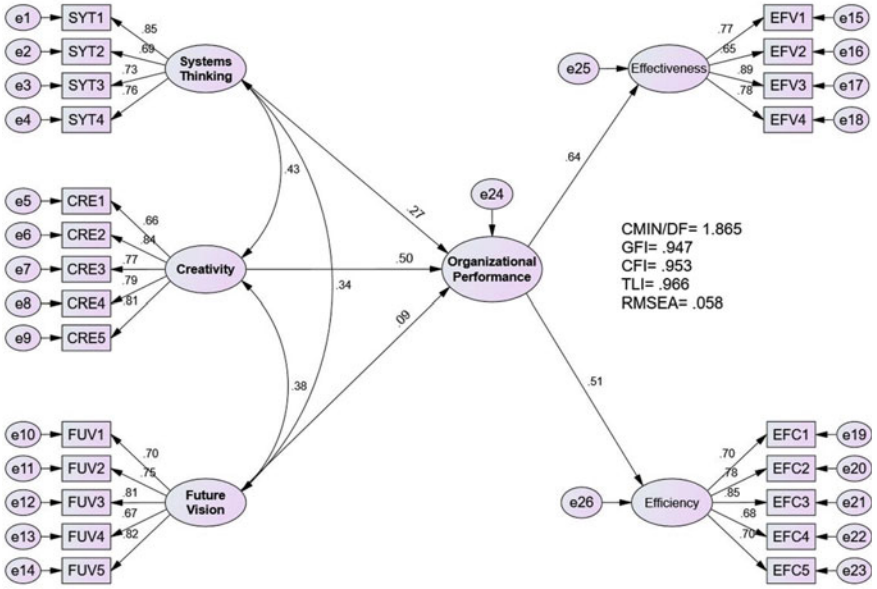

Fig. 2 SEM results of the strategic thinking effect on organizational performance

5.2 Structural Model

The structural model illustrated no multicollinearity issue among predictor constructs because variance inflation factor (VIF) values are below the threshold of 5, as shown in Table 1 (Hair et al., 2017). This result is supported by the values of model fit indices shown in Fig. 2.

The results in Fig. 2 indicated that the chi-square to degrees of freedom (CMIN/DF) was 1.865, which is less than 3 the upper limit of this indicator. The values of the goodness of fit index (GFI), the comparative fit index (CFI), and the Tucker-Lewis index (TLI) were upper than the minimum accepted threshold of 0.90. Moreover, the result of root mean square error of approximation (RMSEA) indicated to value 0.058, this value is a reasonable error of approximation because it is less than the higher limit of 0.08. Consequently, the structural model used in this study was recognized as a fit model for predicting the DEP and generalization of its result (Ahmad et al., 2016; Shi et al., 2019). To verify the results of testing the study hypotheses, structural equation modeling (SEM) was used, the results of which are listed in Table 2.

The results demonstrated in Table 2 show that the highest impact was for creativity ($\beta = 0.504$, $t = 3.489$, $p = 0.001$) followed by systems thinking ($\beta = 0.275$, $t = 2.974$, $p = 0.003$), while future vision ($\beta = 0.088$, $t = 0.978$, $p = 0.849$) had not impact on organizational performance.

Table 2 Hypothesis testing

Hypothesis	Relation	Standard Beta	*t* value	*p* value
H1	Systems Thinking → Organizational Performance	0.275	2.974**	0.003
H2	Creativity → Organizational Performance	0.504	3.489**	0.001
H3	Future Vision →; Organizational Performance	0.088	0.978	0.849

Note *$p < 0.05$, **$p < 0.01$, *** $p < 0.001$

6 Discussion

Understanding the linkage between thinking strategically and organizations performance sets the stage for exploring how managers exploit managerial activities and value creation. Based on the findings and hypotheses presented in this research, the result of the first hypothesis showed that the level of strategic thinking in NGOs in Jordan is moderate, with a mean of (3.49).

There is a positive impact of strategic thinking on performance of NGOs in Jordan; structural testing reported that strategic thinking through its three dimensions namely, systems thinking, creativity and future vision achieved moderate variance in organization performance in term of Effectiveness (R2 = 38%) and achieved low variance in Organization Performance in terms of Efficiency as (R2 = 7%). ST at NGOs in Jordan had a little impact on performance especially in efficiency side. These findings are Inconsistent with previous studies (Jelenc & Swiercz, 2010; Al-Qatamin & Esam, 2018; Moghadam et al.,;2018). At the same time the results showed a high level of organizations efficiency (4.35), this indicates the elements of strategic thinking are not directed towards achieving the goal and there are other factors that affect on performance efficiency. So, the researcher recommends for future studies to know the influencing factors that have achieved the success of the organizations and greatly affect in their efficiency and continuity.

7 Managerial Implications

The researcher suggests some recommendation to promote and support the adoption of strategic thinking factors for NGO managers to build a model of value creation, understand their collaboration well and sees a problem or an opportunity as a part of the whole situation or system and combine creativity with a strategic thinking process that allows employees and organizations to utilize more effectively and leverage the power of their minds in the best way which corresponds with (Bonn, 2005; Liedtka, 1998; Mintzberg, 1998; Senge, 1990).

Strategic thinking is a necessity to address the problems facing organizations in creative ways that allow them to succeed and to provide what is new in their field through the exploitation of resources, knowledge, and skills. So, the organizations need to develop managerial awareness of the importance of strategic thinking and be more flexible to meet unexpected circumstances and adapt quickly to sudden changes to achieve organization objectives and developing their internal resources that in turn enable them to address future problems. The award scheme is an appropriate way to encourage managers and employees to think strategically because this process can motivate them to collaborate. Such an award plan can be presented Influencing members, which leads to important results in management decisions and strategies. It is necessary to encourage initiative and innovation among employees and managers to create a regulatory environment in which everyone motivates innovation in line with Strategic thinking.

8 Limitations and Direction for Future Work

The limitation of this study is based on self-reported data, causal relationships among the independent and dependent variables may be affected by other factors that cannot be controlled. A longitudinal study is needed in order to build a solid ground for the causal direction of relationships. This study using a quantitative approach, so, in order to gain a more in-depth knowledge of the impact of strategic thinking on NGOs' performance, there is a need for a more qualitative approach to research needs to take place. It would be essential for future research to focus on a smaller population to enable a qualitative approach to be used. The researcher believes that this will enable more critical questions to be asked in an interview process.

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The Influence of Electronic Human Resource Management on Intention to Leave: An Empirical Study of International NGOs in Jordan

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Abstract The aim of the study was to examine the impact of electronic human resource management on intention to leave. Therefore, it focused on international non-governmental organizations (NGOs) operating in the humanitarian sector. Data were primarily gathered through self-reported questionnaires created by Google

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_52

Forms which were distributed to a random sample of (620) employees. Structural equation modeling (SEM) was conducted to test hypotheses. The results showed that electronic human resource management had a negative impact on intention to leave. Moreover, the results indicated that the highest impact was for e-performance evaluation. Based on the study results, the researcher recommends organizations to involve employees in databases that enable them to follow the electronic human resources management practices, which is to follow up on the performance appraisal and how it works.

Keywords Electronic human resource management · Intention to leave · International NGOs · Jordan

1 Introduction

Technological development and electronic tools have contributed to the various sciences development such as management, where today employees have a greater awareness than employees in the past, and new technologies have created a new employee's generation and a change in the organizational structure (Al-Hawary & Alhajri, 2020; Al-Hawary & Al-Menhaly, 2016; Al-Hawary & Al-Smeran, 2017; Al-Hawary & Hussien, 2017). Where the changes are organized in such a way that the organizations absence on the global communication network means the loss of huge capital resources, business organizations are nowadays facing many challenges such as globalization, competitive value chain and technological changes (Al-Hawary & Ismael, 2010; Al-Nady et al., 2013; Altarifi et al., 2015; Allahow et al., 2018; Al-Hawary & Al-Syasneh, 2020; Al-Hawary & Obiadat, 2021; AlTaweel & Al-Hawary, 2021). The rapid information and communication technology and its ability to apply it in various organizational fields led to the information technology penetration into human resource processes and systems, which led to a new approach to human resource management called "electronic human resource management" (Al-Hawary et al., 2020; Al-Hawary & Al-Namlan, 2018).Where electronic human resources management is one of the latest topics in the human resources management science as it aims to improve procedures to speed up the human resources functions operations, reduce costs and free managers from administrative restrictions to perform strategic roles (Alkalha et al., 2012; AlHamad et al., 2022; Alshurideh et al., 2022). In addition, increasing efficiency and benefiting from the different dimensions of technology, the rapid development of systems that provide electronic human resources services to employees and managers has allowed more information in a more convenient way that enables them to benefit from this information in the organization resources, so it automates human resources tasks and practices and transforms them from traditional and paper-based activities to electronic activities, allowing organizations to anticipate and transform environmental changes to create the necessary competitive advantage (Al Kurdi et al., 2021; Almaazmi et al., 2020; Harahsheh et al., 2021; Shamout et al., 2022).

What concerns us about the leave work intention is monitoring changes taking place in the workforce size, and there is no doubt that the organization's management is striving to reduce this phenomenon, because the high intention to leave work means that there is a large exit and entry situation to and from the organization (Alhalalmeh et al., 2020; Al-Hawary et al., 2013a, 2013b; Mohammad et al., 2020). This means that the efficiency degree of its workforce will be relatively low due to modernity and lack of experience, which makes the organization face many negative situations (Ahmed et al., 2020; Ahmad et al., 2021a, b; Odeh et al., 2021). As aspiring organizations today seek to achieve excellence and competitiveness, stay in the business world, retain their employees, and reduce the leave work intention by increasing job loyalty levels and achieving high job satisfaction levels, which helps to achieve goals (Abu Qaaud et al., 2011; Metabis & Al-Hawary, 2013; Al-Hawary et al., 2013a, 2013b; Al-Hawary & Harahsheh, 2014; Al-Nady et al., 2016; Al-Lozi et al., 2017; Alshurideh et al., 2017; Alolayyan et al., 2018; Al-Hawary & Al-Khazaleh, 2020). This study provides a scientific explanation to the impact of electronic human resources management on the intention to leave work. Hence the study idea came to identify the impact and importance of the effectiveness of electronic human resources management practices in the intention to leave work, through which it contributes to putting the organization on the right track.

2 Literature Review and Hypotheses Development

2.1 Electronic HR Management Practices

The human resource management department in many organizations focuses on human capital development and advocates human resource planning, performance management, recruitment and employee selection, as human resource management (HRM) scholars have sought to understand the ways in which the efficiency of human resource (HR) practices relates to their employees' attitude (Al-Hawary, 2015; Al-Hawary & Abu-Laimon, 2013). The human resource department is responsible for increasing human resources effectiveness in the organization in order to achieve the individual and society goals (Al-Hawary, 2011; Al-Hawary & Alajmi, 2017). There are many views of human resource management practices concept, which are defined as "a set of functions, activities and programs related to the human resources management affairs in the organization, and aiming to achieve the individuals, organization and society goals (Al-Hawary & Nusair, 2017; Al-Hawary & Mohammed, 2017). These functions, activities and programs include developing human resources strategy, analyzing organization jobs, planning human resources, evaluating employees performance, training and developing them, determining their salaries, wages and additional benefits, motivating them, activating them and addressing their problems to coordinate their goals and needs with the organization needs in which they work, all within the framework of specific organizational

and societal context" (al-Bari Dora and Al-Sabbagh, 2010). Al-Hawary and Nusair (2017) explained that it is a group of administrative activities and efforts that seek to obtain the organization's needs of human resources, develop, motivate and maintain them in order to achieve organizational goals with the highest efficiency and effectiveness level. Akinyemi (2011) defined that it is the organization formal structure which responsible for all decisions, strategies, principles, processes and practices in addition to the total functions, activities and methods related to the management of employees. The researchers dealt with human resource practices differed about its practices, depending on the study community or its nature. Muhammad et al. sees that human resource management practices are represented by (motivation, selection and appointment, training), while Al-Hawary (2015) sees that the practices are represented by (Recruitment and selection, human resource planning, training and development, compensation), while) expanded the practices related to human resource management, which were represented by (human resource planning, recruitment and selection, training and development, job analysis and design, motivation, performance evaluation, Participation in decision-making).One of the technology various dimensions is improving efficiency as it has enabled human resource managers to hire fewer employees who play a more important role in the organization. There are also many viewpoints of the concept of e-HRM practices as) explained as an umbrella term describing the integration of information technology and HR services to automate and facilitate service delivery. The researchers addressed electronic human resource management practices from multiple points of view, but they agreed on the mechanism by which the practices are applied, as the human resource management practices represented by: recruitment, selection, training, performance evaluation and compensation, aim to ensure that employees possess the necessary attributes for effective organizational performance, and to provide a behavioral indicator and appropriate reinforcement to guide and motivate desired behaviors. This can be done via using the main electronic human resource management practices which are (e-recruitment, e-selection, e-training) (Al-Hawary & Nusair, 2017; AlMehrzi et al., 2020; Alshurideh et al., 2021).) believe that the practices are (e-learning, electronic recruitment, selection and appointment, e-training). While Swaroop (2012) sees that electronic human resources management practices are (electronic profile, electronic recruitment, electronic selection, e-learning, e-training, e-compensation, e-leave).When reviewing the literature related to electronic human resources management practices, which were addressed by researchers from different cultural destinations and in different environmental conditions, the researcher believes that electronic human resources management practices represented in (electronic recruitment, electronic learning, electronic performance evaluation, electronic compensation) can be addressed in the current study and may be appropriate for the study community. **Electronic Recruitment**, the mechanism of electronic recruitment works by posting vacancies on the organizations' websites or an online recruitment site. Recruitment refers to the overall process of attracting, selecting, and appointing suitable candidates for jobs. The recruitment process includes analyzing job requirements, attracting employees to work, screening and selecting applicants, and integrating the new employee into the organization-learning: **E-training** is seen as the preferred

learning channel because it can be accessed from different parts of the world with a mouse click on the Internet, and e-training can happen anywhere. The researchers also revealed in the literature on training that the main objective of e-training is to enhance job performance and the extent of satisfaction that the trainee feels. **Electronic performance appraisal**: Macwan and Sajja (2013) define performance appraisal as a formal management procedure that provides an assessment of an individual's performance quality in an organization. As Swaroop (2012) stated that electronic performance appraisal means the company's website use to conduct an online assessment of employees' skills, knowledge and performance over the Internet. **Electronic compensation** is an effective reward and incentives system to enable organizations to respond quickly to changes in the environment, as the rewards and incentives system has become a tool for organizational effectiveness, as the electronic compensation system allows all organization employees to apply electronically in terms of reducing human resources management burden (Al-Khayyal et al., 2021; Alshurideh, 2019, 2022).

2.2 Intention to Leave Work

Human capital is one of the most important organizational assets and it is the most important pillars for maintaining organizational stability, growth stability and market control. Without the human element presence, organizations would not continue to work, and this is observed in major organizations and the rewards, training and loans they provide to their employees (Alshraideh et al., 2017; Al Suwaidi et al., 2020; Nuseir et al., 2021). Where the organizations owners always strive to strengthen the employees' loyalty and spirit, which contributes to the increasing productivity process and continuing to work (Alsuwaidi et al., 2020; Al Shebli et al., 2021). Thus intent to leave is a behavior directed toward leaving the organization, such as looking for a new job and quitting. In this regard, it is important to meet employee's needs and demands towards organizational support (Ammari et al., 2017; Al-bawaia et al., 2022). It is known that the intention to leave work has a negative impact on organizational efficiency and job satisfaction, as this phenomenon causes the organization to bear additional costs as a result of replacing an employee with another. If the employee is not satisfied with his work, this will reflect on his performance, and therefore the quality of service provided by this organization will decrease (Al-Dhuhouri et al., 2020; Al Mehrez et al., 2020). When the employee feels that organization does not fulfill his desires and needs; he will have the idea of leaving work and looking for the nearest presented opportunity (Alameeri et al., 2020; AlShehhi et al., 2020). In this case, the organization will have significant costs, whether direct costs (replacement, recruitment and selection, temporary staff) or indirect costs (morale, pressure on remaining staff, new staff learning) which are perhaps more important than direct costs. Intention to leave the job is the employee's plan to forget the current job and look for another in the near future. Amora (2014) defined the intention to leave work as the general framework for planning the behavior resulting from the

worker's intention and the worker's determination to leave work. Mohammad et al. also defined it as the employee's intention to voluntarily end the work relationship that binds him to the institution in which he works. There are many things that lead to the intention of leaving work, including the imbalance between work and life that employee may suffers, whether managers or employees, which may be represented by several situations, including that there is extra work, or a lack of compatibility with the organization's schedule, as these situations and work pressure can lead to conflicts between work and family (Al Kurdi et al., 2020a, b; Allozi et al., 2022). Thus, the stress that the employee feels without an increase in wages, promotions or vacations, this stress hinders the employee's performance and he may think with the intention of leaving work.

2.3 Electronic HR Management Practices and Intent to Leave

The researchers concluded that there are different relationships between electronic human resources management practices in the intention to leave work. Ali and Khalifa (2013) indicated that there is no direct statistically significant relationship between human resources management practices represented in performance evaluation and the intention to leave work, while the incentives were linked to the performance evaluation results in order to give the employee an incentive to improve his performance. When human resources department managers in organizations undertake the selecting workers process, weights and criteria are set for this process in order to ensure the human elements provision that tend to voluntary practices from the beginning of their integration into employment. Al-Hawary and Alajmi (2017) also indicated that employee's moral factors have an impact on the intention to leave work and the importance of maintaining the positive aspects of these factors in order to avoid reaching negative results, which may eventually lead to the employee leaving his work. While Issam indicated that there is a statistically significant effect of human resources strategies on employees' intention to leave work, the results also showed a statistically significant effect of the perceived organizational support on the employees' intention to leave work While Al-Hawary et al., (2013a, 2013b) indicated that there is a statistically significant effect of human resources strategies on employees' intention to leave work, the results also showed a statistically significant effect of the perceived organizational support on the employees' intention to leave work. Mohammad et al. (2020) indicated that employees job performance is greatly affected by modern human resource management process, and the greatest impact was for job analysis and design, followed by the workers participation in decision-making and performance evaluation, and that all practices positively affect workers performance, the better the application of these practices, the better the performance of workers. Based on above literature, the study hypotheses may be formulated as:

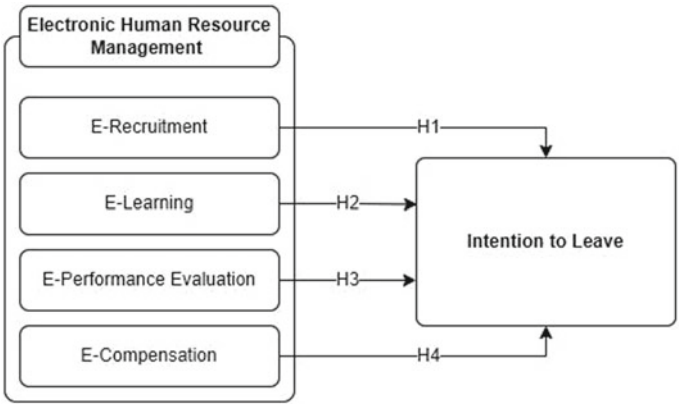

Fig. 1 Research model

There is a significant effect of human resource management practices on intention to leave.

3 Study Model

See Fig. 1.

4 Methodology

4.1 Population and Sample Selection

A qualitative method based on a questionnaire was used in this study for data collection and sample selection. The major aim of the study was to examine the impact of electronic human resource management on intention to leave. Therefore, it focused on international Non-Governmental Organizations (NGOs) operating in the humanitarian sector. Data were primarily gathered through self-reported questionnaires created by Google Forms which were distributed to a random sample of (620) employees via email. In total, (568) responses were received including (16) invalid to statistical analysis due to uncompleted or inaccurate. Hence, the final sample contained (552) responses suitable to analysis requirements that were formed a response rate of (89.03%), where it proved to be sufficient to the extent that was predictable and allowed for a presumption of data saturation (Sekaran & Bougie, 2016).

4.2 Measurement Instrument

A self-reported questionnaire that consists of two main sections along with a section regarding control variables was used as the measurement instrument. Control variables considered as categorical measures were composed of gender, age group, educational level, and experience. The two main sections were dealt with a five-point Likert scale (from 1 = strongly disagree to 5 = strongly agree). The first section contained (20) items to measure electronic human resource management based on (). These questions were distributed into dimensions as follows: five items dedicated for measuring e-recruitment, five items dedicated for measuring e-learning, five items dedicated for measuring e-performance evaluation, and five items dedicated for measuring e-compensation. Whereas the second section included seven items developed to measure intention to leave according to what was pointed by (Mohammad et al., 2020).

5 Findings

5.1 Measurement Model Evaluation

This study was conducted structural equation modeling (SEM) to test hypotheses, which represents a contemporary statistical technique for testing and estimating the relationship between factors and variables (Wang & Rhemtulla, 2021). Accordingly, the reliability and validity of the constructs were tested using confirmatory factor analysis (CFA) through the statistical program AMOSv24. Table 1 summarizes the results of convergent and discriminant validity, as well the indicators of reliability.

Table 1 shows that the standard loading values for the individual items were within the domain (0.531–0.864), these values greater than the minimum retention of the elements based on their standard loads (Al-Lozi et al., 2018; Sung et al., 2019). Average variance extracted (AVE) is a summary indicator of the convergent validity of constructs that must be above 0.50 (Howard, 2018). The results indicate that the AVE values were greater than 0.50 for all constructs, thus the used measurement model has an appropriate convergent validity. Rimkeviciene et al. (2017) suggested the comparison approach as a way to deal with discriminant validity assessment in covariance-based SEM. This approaches based on comparing the values of maximum shared variance (MSV) with the values of AVE, as well as comparing the values of square root of AVE ($\sqrt{}$AVE) with the correlation between the rest of the structures. The results show that the values of MSV were smaller than the values of AVE, and that the values of $\sqrt{}$AVE were higher than the correlation values among the rest of the constructs. Therefore, the measurement model used is characterized by discriminative validity. The internal consistency measured through Cronbach's Alpha coefficient (α) and compound reliability by McDonald's Omega coefficient (ω) was conducted as indicators to evaluate measurement model. The results listed in Table

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Table 1 Results of validity and reliability tests

Constructs	1	2	3	4	5
1. E-Recruitment	**0.740**				
2. E-Learning	0.425	**0.753**			
3. E-Performance Evaluation	0.364	0.348	**0.761**		
4. E-Compensation	0.333	0.452	0.425	**0.766**	
5. Intention to Leave	0.625	0.604	0.633	0.597	**0.761**
VIF	2.064	1.778	1.649	1.947	– -
Loadings range	0.642–0.811	0.681–0.834	0.703–0.812	0.655–0.864	0.531–0.860
AVE	0.548	0.566	0.579	0.587	0.580
MSV	0.371	0.438	0.505	0.425	0.511
Internal consistency	0.854	0.866	0.870	0.874	0.900
Composite reliability	0.857	0.867	0.873	0.876	0.904

Note Bold fonts in the table indicate to square root of average variance extracted

1 demonstrated that both values of Cronbach's Alpha coefficient and McDonald's Omega coefficient were greater than 0.70, which is the lowest limit for judging on measurement reliability (De Leeuw et al., 2019).

5.2 Structural Model

The structural model illustrated no multicollinearity issue among predictor constructs because variance inflation factor (VIF) values are below the threshold of 5, as shown in Table 1 (Hair et al., 2017). This result is supported by the values of model fit indices shown in Fig. 2.

The results in Fig. 2 indicated that the chi-square to degrees of freedom (CMIN/DF) was 1.644, which is less than 3 the upper limit of this indicator. The values of the goodness of fit index (GFI), the comparative fit index (CFI), and the Tucker-Lewis index (TLI) were upper than the minimum accepted threshold of 0.90. Moreover, the result of root mean square error of approximation (RMSEA) indicated to value 0.026, this value is a reasonable error of approximation because it is less than the higher limit of 0.08. Consequently, the structural model used in this study was recognized as a fit model for predicting the intention to leave and generalization of its result (Ahmad et al., 2016; Shi et al., 2019). To verify the results of testing the study hypotheses, structural equation modeling (SEM) was used, the results of which are listed in Table 2.

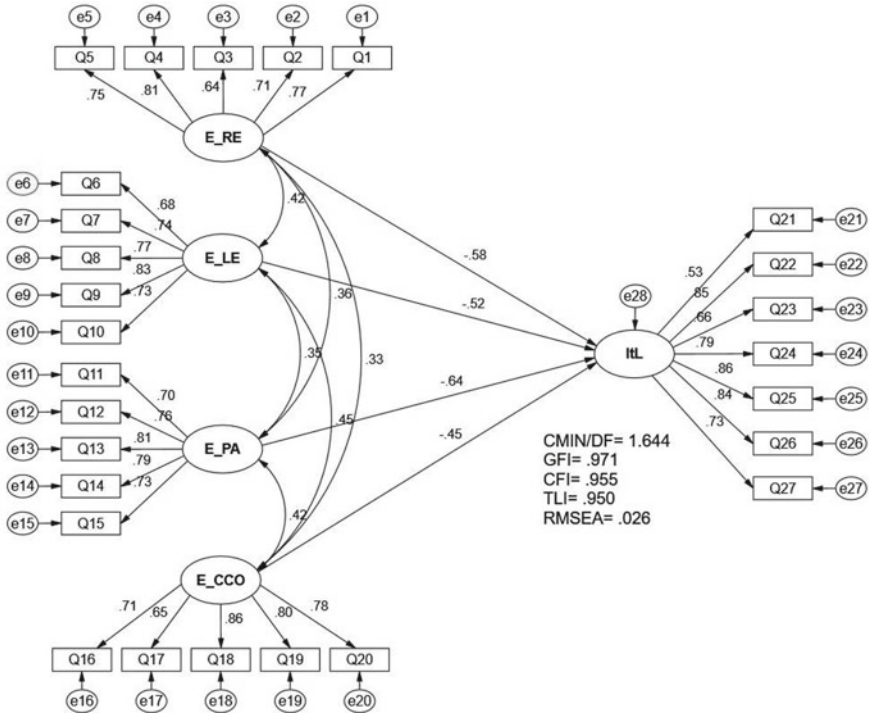

Fig. 2 SEM results of the E-HRM effect on intention to leave

Table 2 Hypothesis testing

Hypothesis	Relation	Standard beta	*t* value	*p* value
H1	E-Recruitment → Intention to Leave	−0.584***	18.611	0.000
H2	E-Learning → Intention to Leave	−0.522***	16.302	0.000
H3	E-Performance Evaluation → Intention to Leave	−0.641***	22.597	0.000
H4	E-Compensation → Intention to Leave	−0.451**	12.095	0.002

Note * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

The results demonstrated in Table 2 show that electronic human resource management had a negative impact on intention to leave. Moreover, the results indicated that the highest impact was for e-performance evaluation ($\beta = 0.641$, $t = 22.597$, $p = 0.000$), followed by e-recruitment ($\beta = 0.584$, $t = 18.611$, $p = 0.000$), then e-learning ($\beta = 0.522$, $t = 16.597$, $p = 0.000$), and finally the lowest impact was for e-compensation ($\beta = 0.451$, $t = 12.095$, $p = 0.002$).

6 Discussions

The results showed the presence of a statistically insignificant effect of the electronic recruitment variable on the intention to leave work. Perhaps the reason behind this is that the electronic recruitment process is considered modern and not applied in all organizations, even if it is applied, the process of sorting applications and matching them with standards is not completely electronic, which in turn affects the employee and makes him think leave work. The results also showed a statistically significant effect of the e-learning variable in the intention to leave work, and the reason is that the process of teaching new employees the skills required to perform work tasks is based on the use of electronic systems in an average manner, as well as the case for determining training needs and evaluating the training process results. There was also a statistically significant impact of the electronic performance evaluation variable in the intention to leave work, which is a logical result in light of the partial reliance on employee performance evaluation through the use of the Internet and the presence of fixed standards based on evaluating employees performance by electronic tools that limit human intervention. In addition to the decisions related to employee's promotion, are still below the required level, as the performance evaluation results are obtained in a traditional way, not completely electronically. As it gives the employee the opportunity to get rid of negative reasons such as unfairness in performance appraisal. Finally, the results showed that there is an impact of the electronic compensation variable on the intention to leave work, and this means that informing employees of incentives through electronic methods is still below the required level, and that the use of electronic systems is partially applied in determining rewards through electronic programs, and the adoption of these programs is still weak in determining the relative jobs value.

7 Recommendations

Based on the study results, the researcher recommends organizations to involve employees in databases that enables them to follow the electronic human resources management practices, which is to follow up on the performance appraisal and how it works, which is done electronically, as well as identifying granting incentives mechanism and following up on training programs provided by the organization through modern technology tools. The researcher also recommends involving employees in paid training courses to raise their satisfaction and efficiency with work, in addition to providing an appropriate work environment for employees to reduce leaving work idea. The study also recommends that the electronic performance evaluation criteria should be clear to all employees and that they be familiar with their performance evaluation results, as this increases the employee's belief in the electronic evaluation fairness and integrity.

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The Mediating Effect of Organizational Commitment on the Relationship Between Work Life Balance and Intention to Leave

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Abstract This study aimed to measure the mediating effect of organizational commitment on the relationship between work life balance and intention to leave. The study population is consisted of (800) working women in king Abdullah university

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_53

hospital. To collect the primary data questionnaire survey was distributed to (200) working women and (144) questionnaires were returned. The study uses ordinary least square (OLS) technique to run simple regression and test hypothesis where the work life balance is used as independent variable and intention to leave as dependent variable, for mediating effect the study used the organization commitment variable. After analysis, study found that affective commitment has fully mediated the relationship between work life balance and intention to leave. While normative commitment has partially mediated the relationship between work life balance and intention to leave among working women in King Abdullah University Hospital. In light of previous findings, the researchers recommends adoption of work life balance program in Jordanian hospitals, to improve the motivation and commitment of women employees for better organizational performance.

Keywords Work life balance · Organizational commitment · Intention to leave · King Abdullah university hospital · Jordan

1 Introduction

Today Arab women occupy an important position in modern societies and contribute effectively in advancing and developing their countries economy. Women have become a key partner in success of their organization (Aburayya et al., 2020; Kabrilyants et al., 2021). However, they face extra demand due of their roles in work and home; they should do their best at work and take care their families when baking home. The main factor that leads to the success of women in their work is the ability of achieving balance between family obligations and work demands. Therefore, the failure to achieve this balance will negatively influence their duties towards home and work, that leading to the occurrence of physical and psychological problems and consequently, reducing her life satisfaction (Al Khayyal et al., 2020; Nuseir et al., 2021).

Women working in the Middle East are not an exception to the rule, the perfect balance between work and personal life remains the most important challenge faced by women in Middle East as they are first responsible for the welfare of their families and care for their children (Abu et al., 2012). And while, she made strides to have a more flexible treatment in the workplace in terms of working hours and the establishment of units for the care of children in the workplace and work-sharing arrangements; she still face social pressure to comply with standards that force them to be ideal mother and ideal employee and so on a daily basis.

The conflict between work and family is considered as an important issue for organizations and individuals due to its association with negative results (Lyness &

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Judiesch, 2008). For example, the conflict between work role and family life role is associated with increased absenteeism and labor force turnover, low performance in the work place, and poor physical and mental health (Agha et al., 2021; Mohammad et al., 2020). One of negative consequences of work life balance is intention to leave, which is costly for organization. The cost of Replacing one hospital nurse has been estimated to be around $42,000 in Canada (Strachotaet al, 2003). Current studies in the Health Industry are paying attention to how to address the high cost of labor turnover and staff shortage (Chaaban, 2006). Although the significant of work life balance, little attention is paid to this issue in Arab word. The best of researcher knowledge no studies have been conducted in Arab countries (include Jordan) to investigate the effect of work life balance on intention to leave among working women. Therefore, the current study is carried out to fill the gap in literature by investigate the mediating effect of organizational commitment on the relationship between work life balance and intention to leave.

2 Theoretical Framework and Hypotheses Development

2.1 Work Life Balance

The work life balance of employees has come to focus during second half of the twentieth century (Naithani, 2010). The research on working mother has started during 1960 (Lewis et al., 2007). However, before 1970, the work life and family life were treated separately (Blunsdo et al., 2006). After 1970, various research articles were published regarding this issue. In 1977, when some research was conducted on interdependence between work life and family life (Pleck, 1977).

There are only quite general and no homogenous definitions of the term work-life balance. There has been a wealth of earlier revisions trying to deliver a theoretical definition of the concept of work-life balance. For example, Fleetwood (1977) defined work-life balance as “the relationship between cultural and institutional spaces and times of work and non-work in civilizations where income is primarily created and distributed through labor markets”. Greenblatt (2002) characterizes work-life balance by "the absence of unacceptable levels of conflict between work and non-work demands". And Voydanoff (2005) defines work-family-balance as “a global assessment that work and family resources are sufficient to meet work and family demands such that participation is effective in both domains”. This definition serves as a basic concept for this thesis as it shed lights elements that entail work family-balance and thus are in the center of interest. Another Definition of the work-life balance was introduced by the Rigby & O’Brien (2010) that work-life balance is a split of time between the work and personal life based on the priorities. In this definition, there is clear indication between the time management for both lives, one is personal life and other is official life. Priorities of the people may be different based on their perceptions, but the main thing is the consideration of both lives rather just

focusing on the single one. Because if the focus is shifted to the single side of the life only, then it is likely that balance would go out and effectiveness of the life may be compromised (Irene, 2014).

2.2 *Organizational Commitment*

The theoretical concept of the organizational commitment is elaborated along with the definitions of the organization commitment. The concept of the organizational commitment has taken a considerable importance over the years and become an essential feature of the researches that are connected with the employees and the organizations (Alhalalmeh et al., 2020; Al-Hawary & Alajmi, 2017; Al-Hawary et al., 2020; Alketbi et al., 2020; Metabis & Al-Hawary, 2013) It has been defined as a psychological state that combine an employee to an organization, that lead to reduce the turnover of employee (Allen, 2000). There are several definitions being introduced by the researchers about the organizational commitment (Al-Hawary & Abu-Laimon, 2013; Al-Hawary & Al-Namlan, 2018; Al-Hawary et al., 2013; Al-Lozi et al., 2018). One definition of the organizational commitment is, "it is a multidimensional approach in nature which intends to analyze the attitude of the employee for the achievement of the organizational goals in addition to the membership willingness" (Al-Hawary, 2015; Al-Lozi et al., 2017; Meyer & Herscovitch, 2001). This definition is clearly based on two points where one is targeting the intention of the employee to be part of the organization and the other is merely based on the working attitude of the employee because both these things indicate the commitment of the employee with the organization. The definition is, "Organizational commitment is basically a person's attachment with the organization with the intention to stay with it along with the identification of the organizational goals so that extra effort can also be put in the consideration of achieving this" (Meyer et al, 2002). As per the analysis of all these definitions presented above, it shows that there are several things which are common among these definitions and these are termed to be part of the organizational commitment. One important factor, which is common in most of the definitions, is the commitment of the employee to stay in the organization for a longer period of time by providing a quality work with continuity (Al Kurdi et al., 2020a, b; Alameeri et al., 2020). The other thing, which is being focused on the definitions, is the goal of the organization and goal congruence. Organizational goals are simple that these are the aims of the organizations but the goal congruence is basically the unity of goals, goal of the employee and of the organization (Al-Hawary & Al-Syasneh, 2020; Allozi et al., 2022). This means that employees act in such a way that their goals are also attached with the goals of the organizations.

There are basically three models of the organizational commitment which are also known as commitment models. Meyer et al. (1993) explain that an employee's commitment reflected a need, desire and obligation to maintain membership in an organization. So the models of organization commitment can be outlined as

follows: ***Continuance Commitment*** occurs when an employee remains in organization because there are largely out of need, as lack of alternatives or costs associated with leaving, such as lost income, or an inability to transfer skills and education to another organization are the primary antecedents of continuance commitment (Meyer et al, 2002). ***Affective Commitment*** has been linked to positive work-related behaviors like organizational citizenship behavior (Meyer et al., 2002). Affective commitment model is linked with the wish of the employee to stay in the organization due to multiple reasons perceived by the employee himself. it is associated positively with organizational citizenship behaviors and negatively with turnover cognitions. ***Normative Commitment*** is more emotional and sense of liability-based model as compared to the other than two models discussed above. The basis of this model is different from the other two models and results in a more positive way for the organization. The employee feeling of moral obligation to stay in the organization because he feels that the organization has spent a lot of the resources in the grooming and the teachings of the employee.

2.3 Intention to Leave

Intention to leave is one of the measurements of performance (Abu Qaaud et al., 2011; Al-Nady et al., 2013; Al-Nady et al., 2016; Alshurideh et al., 2017; Alolayyan et al., 2018; Allahow et al., 2018; Al-Quran et al., 2020; AlTaweel & Al-Hawary, 2021; Altarifi et al., 2015; Al-Hawary & Alhajri, 2020; Al-Hawary & Obiadat, 2021). Intention to leave is defined as the planning of an employee to leave the current job and search for another job in near future time (AlShehhi et al., 2020; Alsuwaidi et al., 2020; Alshurideh, 2022). It is the willingness of the employees to leave the organization. There are several definitions being introduced of the intention to leave. According to the definition given by the Chaaban (2006) it is being defined as the intention of turnover whereas the definition given by Barak and Nissly (2001) it means that a serious consideration of leaving the job at present. However, the definition given by the (Chan & Morrison, 2000) is a little bit changed from the above two definitions. They said that intention to leave is about having a deliberate desire to leave the current employment. Aiken et al. (2002) defined this as a prediction of the future behavior because the intent is linked with the future action, which is based on the behavior, so it is very much integrated definition. It is clear that there have been similarities in the definitions being proposed by the plenty of writers. This "Employee Retention" is one of the major problems that are faced by present organizations (Ammari et al., 2017; Al-bawaia et al., 2022; Al Shebli et al., 2021). To maintain their workforce and to reduce the rate of erosion the organizations deliver visions into staff retention strategies, techniques and measures. In order to retain valuable employees, every employee should be given a proper attention.

2.4 Organizational Commitment, Work Life Balance and Intention to Leave

The research aims to investigate the work life policies and their effect on organizational commitment and intention to leave the organization of female employees in Jordan. Arab Muslim female has to perform more responsibilities in family than women in developed countries do. Hence, a work life balance is more difficult for them, which may lead to leave the organization. Effective work-life balance policies can solve this issue, which is the focus of this research. Kim (2014) concluded that there is a direct relationship between work-life balance with affective commitment but not with in-role performance. However, affective commitment can affect the in-role performance and hence, there is an indirect relationship between work-life balance and in-role performance. Tummers et al. (2013), concluded that development and career opportunities as well as work atmosphere are most influential factor that affect the turnover intention. Lee et al. (2013) found that individual related features such as marital status, education level etc. and work related features such as Work unit and teaching hospital are correlated with nurses' intention to leave their organization. Seven indicators were used to measure the quality of work life. Among them four (supportive milieu with job security and professional recognition, work arrangement and workload, work or home life balance, and nursing staffing and patient care) are correlated with nurses' intention to leave their organization. Nwagbara and Akanji (2012) found that women face more work life imbalances than men do. Women have more responsibilities, which pressurize themselves and reduce their motivation and commitment. Sakthivel and Jayakrishnan (2012) thought that working load interfere with their family greatly, but their family do not interfere with working significantly. The study also found that there is a positive relationship between work life balance and organizational commitment. Noor (2011) found that there is a negative correlation between perceived work life balance satisfaction and intentions to leave the organizations. The result of the study also indicated that job satisfaction and organizational commitment can act as partial mediator to define the relationship between work life balance and intentions to leave the organizations. Malone (2010) identified some factors, which causes dissatisfaction of the employees such as attitudes of the owner and/or managers, fairness, equality etc. These issues cannot be solved by work life balance policies as they are related to personal attitude. Kamel (2013) concluded that Affective Commitment can fully mediate the relationship between Quality of Work Life and Intention to Leave. Work life balance, organization commitment and intention to leave the organization: all are important factors for better human resource management and overall performance of the organization. From above studies, it is clear that these three are related to each other. Based on the literature above, the study hypotheses may be formulated as:

Organizational commitment mediates the relationship between work life balance and intention to leave among working women in King Abdullah University Hospital.

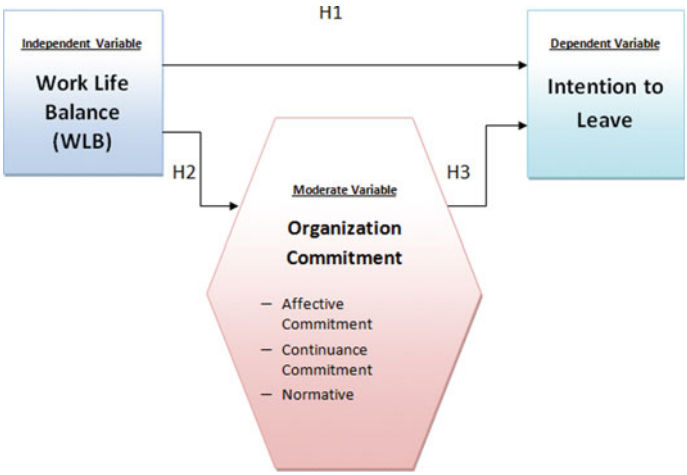

Fig. 1 The research model based on theoretical framework

3 Model and Variable of the Study

Based on previous literature the researcher prepared the following model in Fig. 1 that contains independent variable (work life balance) that measure their effect on dependent variable (intention to leave) through the mediating variable (organization commitment).

4 Research Methodology

4.1 Population and Sample

The female employees in king Abdullah University Hospital were the target population of the study with approximately (800) female employees. The sample frame comprised of working women in King Abdullah University Hospital at all degree levels, single and married with at least one year of experience of being employed with KAUH, the sample of the current study consist of 200 employees, which represent 25 percent of the study population. A sample population consisting of working women in King Abdullah University Hospital to achieve the goal of this study.

4.2 Instruments and Reliability

Based on previous studies and empirical review, a questionnaire was developed to explore the relationship between the work life balance, organizational commitment and how affect the intention to leave of female employees in King Abdullah University Hospital. The data gathering instruments used in this study were previously used instrument and measured the three variables. The general model is basically divided into three parts. Part one consists of three items of work life balance based on the work of (Hayman, 2005). Part two consists of organization commitment based on the work of (Meyer et al., 1993), Part three consists of intention to leave based on the work (Lee et al., 2013).

4.3 Validity and Reliability

Validity refers to the instrument should contain items related to the study variables, and it measures them accurately and clearly. To examine the validity of the survey and to ensure no biases with multiple interpretations or inappropriate and unclear wording, the tool of this study questionnaire was in English, but it was translated from English to Arabic by the researcher, then evaluated, the questionnaire had been sent to a number of specialist in business administration field.Their comments and recommendations were taken into consideration to improve some of the questionnaire items in a manner that fits the study variables measurements.

Reliability an indication of stability and internal consistency. It was established by calculating Cronbachs' Alpha coefficient which is an evidence indicating how well the questions are positively correlated to one another. Obtaining (Alpha ≥ 0.60) considered in practice for management science and Humanities is acceptable in general (Sekaran, 2003). Reliability coefficient for the main content of the questionnaire values ranged between (0.69) and (0.87), Hence it is acceptance values for the purposes of our analysis and test hypothesis, and the following Table 1 shows the results of Cronbach s Alpha for each dimension.

5 Analysis

H1.1: Affective Commitment mediates the relationship between work life balance and intention to leave among working women in King Abdullah University Hospital**.** The following model illustrates the nature of relationship between dependent, independent and mediator variables (Fig. 2).

To test this hypothesis, we used path analysis using regression technique results, the results are presented in Table 2, as illustrated in the below table, we noticed B and t turn out to be insignificant; this means that Affective Commitment fully

Table 1 Scales reliability

Variable measured	Dimensions	Number of items	Cronbach's Alpha
Work Life Balance	Work interference with personal life (WIPL)	7	0.87
	Personal life interference with work (PLIW)	4	0.71
Organization commitment	Affective commitment	6	0.80
	Continuance commitment	6	0.78
	Normative commitment	6	0.79
Intention to leave		6	0.69

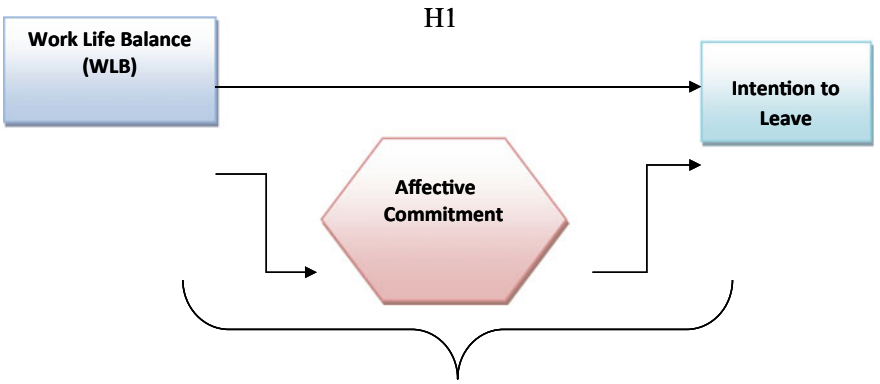

Fig. 2 First mediate model

mediates relationship between Work Life Balance (WLB) and Intention to leave. So, Hypothesis 1 is supported (Accepted). This explanation supported by previous research like (Kamel, 2013).

H1.2: Normative Commitment mediates the relationship between work life balance and intention to leave among working women in King Abdullah University Hospital**.**

Table 2 Path analysis for the mediating effect of affective commitment between WLB and intention to leave

Predictors	dependent variable	B	t	Sign. t	R^2	F	Sign. F
WLB	**Affective Commit.**	−0.705	−8.468	**0.000**	0.336	71.714	0.000
WLB	**Intention to Leave**	0.355	4.298	**0.000**	0.115	18.477	0.000
WLB + AC	**Intention to Leave**	0.179	1.82	**0.071**	0.171	14.553	0.000

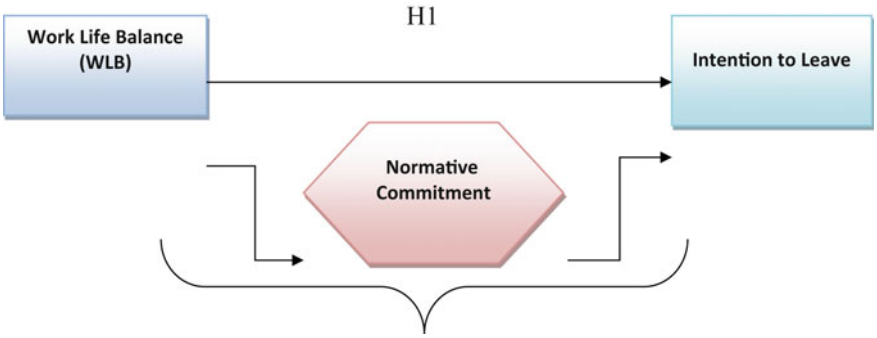

Fig. 3 Second mediate model

Table 3 Path analysis for the mediating effect of normative commitment (NC) between WLB and intention to leave

Predictors	Dependent variable	B	t	Sign. t	R^2	F	Sign. F
WLB	**Normative Commit.**	−0.194	−2.044	**0.043**	0.029	4.176	0.043
WLB	**Intention to Leave**	0.355	4.298	**0.000**	0.115	18.477	0.000
WLB + NC	**Intention to Leave**	0.325	3.934	**0.000**	0.141	11.62	0.000

The following model illustrates the nature of relationship between dependent, independent and moderator variables (Fig. 3).

To test this hypothesis, we used path analysis using regression technique results, the results are presented in Table 3, as illustrated in the below table, we noticed B and t remained significant; this means that Normative Commitment (NC) partially mediates relationship between Work Life Balance (WLB) and Intention to leave. So, Hypothesis 1.2 is supported (Accepted).

6 Conclusion and Discussion

The balance between the work and life is essential for a healthy land happy life because extra time spends on the work leads to work stress and extra time spends at home leads to the unsuccessful life. A high turnover is not considered a good sign for a corporate organization. If too many employees leave a particular organization, other experts or professional will think that there is a problem in the organization for which the employees left. Therefore, they will not be willing to join the organization (Davis & Kalleberg, 2006). Thus, intention to leave of the employees creates adverse

effect on organizations. However, women in organization are increasing, they have dual roles at work and at home, this put extra pressure on women, they struggle than men to balance between demand of work and life. Organizational commitment is further being explained as the employee's commitment to continue to stay in the organization and the integration of the self-goals with the goals of the organization because it is the way to pay for the affiliation with organization.

The aim of the study is to examine the mediate effect of the Organizational commitment on the relationship between work life balance and intention to leave among working women in King Abdullah University Hospital. The study found that affective commitment has fully mediated the relationship between work life balance and intention to leave. While normative commitment has partially mediated the relationship between work life balance and intention to leave among working women in King Abdullah University, the results of the study are consistent with Kim (2014), he concluded that there is a direct relationship between work-life balances with affective commitment, and Nwagbara and Akanji (2012) found that women face more work life imbalances than men do. Women have more responsibilities, which pressurize themselves and reduce their motivation and commitment. And Kamel (2013) concluded that Affective Commitment can fully mediate the relationship between Quality of Work Life and Intention to Leave. Work life balance, organization commitment and intention to leave the organization. The research conducted by Clutterbuck (2003) showed that the employees having been provided with work life opportunities believed more in commitment to the work and to the organization.

So, there must be some flexibilities for women during their working hours in order to have an ability to create the balance between the work and life such as compressed hours, short time and flexible timings, those are very effective policies for women. The theories of the work life balance are applied differently to women because their perception and the attitude are different from those of men. For more illustration, let's take this example: it is about a mother, who has plenty tasks to perform and these tasks cannot be done by a man like feeding the child, taking care of the child at home and also handling the routine tasks like house cleaning and cooking (Clutterbuck, 2003). These factors clearly show that women require more time to spend at home, but this would create the lack of balance between the work and life at home; so basically, if a little flexibility is given to women, they will easily maintain the balance. So, these are basically the major differences between men and women, these differences have caused more emphasizing on the work life balance for women contradictory to the less importance given to men.

The employees of the organizations with work life opportunities are more satisfied with the organization and have more willingness to work for the organization. This helps organization in retention of staff. (Booth & Jan, 2008). Work pressure is one of the causes of the high turnover. This is a state where the employee finds himself stuck in the work and has the specified deadline coming which puts an immense pressure on the tissues that it becomes harder for him to concentrate. Employee facing such situation may suffer from physiological and physical problems, so they may think about leaving organization (Obeidat et al., 2019; Kristensen, 2000; Alshurideh et al., 2022).

7 Recommendations

Based on the study results, the researchers recommend managers and decision makers to adopt work life balance program, to improve the motivation and commitment of women employees for better organizational performance. The recommended programs as safety, reward, promotion, flexible hour, training, payment, childcare support, parental leave, and to provide work life balance program is necessary for woman in Jordanian hospitals to increase job satisfaction that lead to enhance commitment for organization and reduce intention to leave. The organizations must enhance the participation of employee in decision making and locus of control to improved organization commitment. Finally, organization should give special attention to commitment its vision and goals in such a way that is consistent with the employee values to enhance affective commitment.

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Electronic HR Practices as a Critical Factor of Employee Satisfaction in Private Hospitals in Jordan

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Abstract The aim of the study was to examine the impact of e-human resource management on employee satisfaction. Therefore, it focused on the private hospitals in Jordan. Data were primarily gathered through self-reported questionnaires creating by Google Forms which were distributed to a purposive sample of (320) physicians.

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_54

In total, (285) responses were received including (11) invalid to statistical analysis due to uncompleted or inaccurate. Hence, the final sample contained (274) responses. Structural equation modeling (SEM) was conducted to test hypotheses. The results showed that E-human resource practices had a positive impact on employee satisfaction except e-compensation. They also indicated that the highest impact was for e-development. According to the study's findings, managers and decision-makers should follow the contract's implementation of all employee rights, as well as the employee's commitment to carry out all of the duties entrusted to him, ensure the employee's job stability, and work to ensure that an organization offers advanced technologies based on employee performance evaluation.

Keywords Electronic HR practices · Employee satisfaction · Private Hospitals · Jordan

1 Introduction

In today's information-based economy, an electronic human resources management system is a must to deal with the challenges of human resources in the twenty-first century (Al-Hawary et al., 2020; AlHamad et al., 2022). Web-based human resource management solutions, often known as an electronic human resource management system, are becoming increasingly popular in businesses (Al-Hawary & Al-Namlan, 2018; Swaroop, 2012). As surveys of human resources consultants' show, the number of organizations adopting the electronic human resource management system (E-HRM) and the depth of applications within organizations is constantly increasing, the rapid development of the Internet over the last decade has led to an improvement in the implementation and application of electronic human resource management. Academic interest in electronic human resources management has risen as a result of the publication of numerous issues of journals devoted to human resources and the existence of a group of empirical studies in the field (E-HRM). HRIS is known as E-HRM, according to Stone and Dulebohn, because organizations have enabled online HR transactions. Because it automates human resources tasks and practices and transforms them from traditional and paper-based activities to electronic activities, the rapid development of systems for providing electronic human resources services to employees and managers helps them obtain additional information in a more convenient way so that they can benefit from the information in organizational resources (Alkalha et al., 2012; Alshurideh et al., 2022).

Satisfaction is a term that refers to a mix of psychological, functional, and environmental variables that contribute to an employee's happiness at work (Al-Hawary & Obiadat, 2021; Alhalalmeh et al., 2020; Al-Hawary & Alhajri, 2020; Al-Hawary & Al-Khazaleh, 2020; Alolayyan et al., 2018; Alshurideh et al., 2017; Al-Hawary & Al-Menhaly, 2016; Al-Nady et al., 2016; Al-Hawary & Al-Smeran, 2017; Al-Hawary et al., 2017; Al-Hawary & Harahsheh, 2014; Altarifi et al., 2015; Al-Hawary & Hussien, 2017; Al-Hawary, 2013; Al-Hawary et al., 2013a, b). Furthermore, it is

an understanding of the difference between what a person expects from his job and what he actually gets (Al Kurdi et al., 2021). Positive feedback on the extent to which the job satisfies the employee's aims and objectives is included in job satisfaction. Employees typically attempt to attain their goals and fulfill their wishes by giving the appropriate performance, as well as the employee's knowledge of specific changes and conditions that may affect him while at work (Alsuwaidi et al., 2020; Al-bawaia et al., 2022). Organizations are interested in the topic of job satisfaction because a higher degree of job satisfaction correlates with a lower percentage of employee absenteeism, implying that there is a link between job satisfaction and workplace productivity (Alameeri et al., 2020; Kurdi et al., 2020). Employee satisfaction is one of the issues that must be examined from time to time owing to variances in human nature as a result of current improvements in our world, and it is still a research topic (Al Kurdi et al., 2020; AlShehhi et al., 2020). The purpose of the study was to see how electronic human resource management affected employee satisfaction.

2 Theoretical Framework

2.1 Electronic HR Management Practices

Because the human resources department focuses on the human aspect, it is one of the most crucial administrative roles on which any corporation is built (Al-Hawary, 2009; Al-Hawary et al., 2012; Al-Hawary & Mohammed, 2017). Organizational success or failure is determined by the efficiency and effectiveness of human resource management techniques. Human resource management is defined as the department in charge of increasing the effectiveness of human resources in the organization in order to achieve individual and societal goals, and it is thus the department in charge of enabling the organization to build, maintain, and develop its strategic advantages (Al-Hawary & Nusair, 2017).

Human resource management, according to Al-Hawary (2011), is the total of functions within an organization, including hiring the right personnel and managing labors relations, as well as both the strategic and operational perspective of the firm's needs. They are identified procedures and activities that support common institutional goals by combining the demands of the organization and the needs of the individuals who work for it, according to Keshway (2008). Electronic human resources management (E-HRM) is described by Parry and Tyson as the use of technology in human resource management functions and communication via technology directed through networks between the organization and its personnel.

Electronic human resource management is defined by Schramm (2006) as a method of implementing human resource management strategies, processes, and policies in an organization through direct and conscious directed support based on various online technologies. According to AlTaweel and Al-Hawary (2021), it is a technology that allows human resources functions to establish new areas

of contribution to company performance. Electronic human resource management strives to provide a comprehensive, thorough, and continuous information system for employees and occupations at a fair cost, as well as support future planning and policy formulation. Automate personnel information and make human resource demand and supply discrepancies easier to track.

Researchers measured a set of techniques for electronic human resource management, and their opinions on the procedures vary. For example, Mohammad et al. (2020) see electronic human resource management practices in (work analysis and design, recruitment, selection, compensation and benefits), whereas) see electronic human resource management practices in (work analysis and design, recruitment, selection, compensation and benefits) (electronic polarization, electronic selection, electronic training, electronic compensation, electronic performance evaluation, and electronic communication). The researcher believes that the practices of electronic human resources management represented in (electronic recruitment and selection, electronic development, electronic performance evaluation, electronic compensation, and electronic communication) can be addressed after reviewing studies related to the practices of electronic human resources management that were addressed by researchers from various cultural destinations.

It may be appropriate for the current study's population. **Electronic recruitment:** E-recruitment, according to Swaroop (2012), is the use of a company's website to attract prospects and receive electronic applications. E-recruitment has a number of advantages, including 24/7 access to online opportunities, the comfort of job examination without the physical stress of an interview, and the ability for applicants to obtain a thorough grasp of the business and its culture before joining it. **Electronic development:** Organizations have resorted to developing training and integrating it with technology in order to effectively trains their employees. As a result, organizations have begun to use a new term called e-training, whose main goal is to improve job performance and the extent of satisfaction that the trainee feels, as well as to create a productive workforce. E-training, according to Al-Hawary and Alajmi (2017), is "skills training using modern computer technologies." **Electronic performance appraisal**: This practice is based on evaluating human resource performance via the Internet, which means that managers can provide performance information directly to the human resources department via electronic forms, reducing the use of paper for supervisor and control, as well as the time and cost of the strike for resource management. Managers can also use human self-service tools to enter performance appraisal management outcomes in real time. **Electronic Compensation:** Electronic compensation is one way to a compensation toolkit that allows a company to gather, store, analyze, and use compensation data and information. The use of a company's website to arrange employee remuneration is defined by Swaroop (2012) as an organization's pay strategy should be able to attract the right kind of personnel, keep them, and ensure that they are treated fairly. **Electronic communication**: The ability to communicate solely through electronic means, removing the need for physical contact and allowing for geographical dispersion of organization members, as well

as online collaboration via e-mail, discussion boards, and chats, as well as telephone and fax communications, promises to eliminate time and space constraints (Lee & Kim, 2009).

2.2 Employee Satisfaction

Job satisfaction is one of the most important factors in determining the efficiency and effectiveness of business organizations (Alshurideh, 2022; Hayajneh et al., 2021). Employees are an important part of the process of achieving the company's mission and vision, so they must meet the organization's performance standards to ensure the quality of their work (Alzoubi et al., 2022). We considered a number of negative consequences of job unhappiness, including disloyalty, greater authoritarianism, and a rise in the number of accidents. Employees require a working environment that allows them to operate freely without being hindered from achieving their full potential (Alshraideh et al., 2017; Alzoubi & Inairat, 2020). Job satisfaction is a complicated and varied notion that can mean different things to different people (Aburayya et al., 2020; Alshurideh et al., 2012). For example, what satisfies one employee may not satisfy another. For all employees, there is no single measure of job satisfaction. As a result of exposure to a group of psychological, social, professional, and material elements, it describes the psychological or emotional state that the employee achieves at the degree of certain satisfaction.

Job satisfaction and motivation are linked, although the basis of this correlation is unclear. Job satisfaction, according to Al-Lozi et al. (2017), is described as a feeling of inner loyalty and pride experienced when performing a specific task. Employees' typical feelings and feelings about their work are referred to as job satisfaction (Al-Dmour et al., 2021; Allozi et al., 2022). Positive attitudes toward the workplace indicate job satisfaction, whereas negative attitudes toward the job indicate job discontent (Al-Khayyal et al., 2020; Armstrong, 2006). According to George and Jones (2008), job satisfaction is a set of feelings and beliefs that people have about their current job. Job satisfaction levels can range from extreme satisfaction to complete dissatisfaction. In addition to attitudes about their jobs as a whole, people can have attitudes about different aspects of their careers such as the type of work they do, coworkers, supervisors, or developers, and their pay.

Job satisfaction, according to Hoppock is "any combination of psychological, biological, and environmental variables that leads a person to honestly state that I am content with my job". Job satisfaction is the sum of a worker's positive and negative feelings about their work. Job circumstances were discovered by Metabis and Al-Hawary (2013). It is a significant factor for job satisfaction for workers who work in challenging working conditions; as a result, employees in these situations are dissatisfied with their jobs, and it was required for management to improve working conditions in order to promote employee happiness. As a result, their overall work performance will improve (Alketbi et al., 2020; Sultan et al., 2021).

2.3 E-HR Management Practices and Employee Satisfaction

Employee satisfaction and computerized human resource management approaches have varied correlations, according to the researchers. According to Wadi (2018), there is a favorable link between the benefits of an electronic human resources management (E-HRM) in terms of streamlining work procedures, decreasing the load and efficacy of communications, and transparency between satisfaction and satisfaction. Employees gave feedback on how to utilize the system, the ease with which it could be used, its suitability for work, and the level to which technical capabilities were available. In addition to Al-Shakhanbeh (2015), who referred to the identification of the role of electronic human resources management in the quality of job performance, the study's findings revealed that there is a statistically significant effect of human cadres in the quality of job performance, as well as the presence of a statistically significant effect of human cadres and electronic human resources management software in continuous improvement in Orange Company.

Through the mediating function of employee satisfaction, Khan et al. (2019) investigated the impact of human resource management methods (selection and appointment, training and development, performance evaluation, and compensation) on employee performance in six Pakistani public institutions. And it came up with a set of conclusions, the most important of which are: Human resource practices have a significant impact on faculty members' job performance, with job satisfaction serving as a mediating factor; in addition, human resource management practices have a positive impact on job satisfaction; and job satisfaction has a positive impact on improving faculty members' performance in these universities.

Madanat and Khasawneh (2018) investigated the effectiveness of human resource management practices (manpower planning, selection and appointment, training and development, compensation, and performance evaluation) and their impact on employee satisfaction in 15 commercial and Islamic banks. It came to a set of conclusions, the most important of which is that the banking sector uses human resource management practices at a high level, with the exception of compensation, which is at a medium level, employee satisfaction is at a medium level, and there is a strong and positive statistical relationship between human resource management practices and job satisfaction. Based on above literature review, the study hypotheses may be formulated as:

E-HR management practices have a significant impact on employee satisfaction

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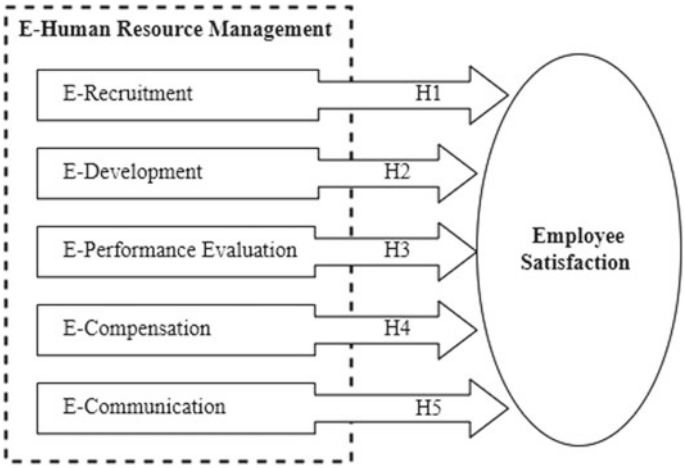

Fig. 1 Research model

3 Study Model

See Fig. 1.

4 Methodology

4.1 Population and Sample Selection

A qualitative method based on a questionnaire was used in this study for data collection and sample selection. The major aim of the study was to examine the impact of e-human resource management on employee satisfaction. Therefore, it focused on the private hospitals in Jordan. Data were primarily gathered through self-reported questionnaires creating by Google Forms which were distributed to a purposive sample of (320) physicians via email. In total, (285) responses were received including (11) invalid to statistical analysis due to uncompleted or inaccurate. Hence, the final sample contained (274) responses suitable to analysis requirements that were formed a response rate of (85.6%), where it proved to be sufficient to the extent that was predictable and allowed for a presumption of data saturation (Sekaran & Bougie, 2016).

4.2 Measurement Instrument

A self-reported questionnaire that consists of two main sections along with a section regarding control variables was used as the measurement instrument. Control variables considered as categorical measures were composed of gender, age group, educational level, and experience. The two main sections were dealt with a five-point Likert scale (from 1 = strongly disagree to 5 = strongly agree). The first section contained (24) items to measure e-human resource management based on (). These questions were distributed into dimensions as follows: four items dedicated for measuring e-recruitment, five items dedicated for measuring e-development, five items dedicated for measuring e-performance evaluation, five items dedicated for measuring e-compensation, and five items dedicated for measuring e-communication. Whereas the second section included eight items developed to measure employee satisfaction according to what was pointed by (Al-Hawary et al., 2013b).

5 Findings

5.1 Measurement Model Evaluation

This study was conducted structural equation modeling (SEM) to test hypotheses, which represents a contemporary statistical technique for testing and estimating the relationship between factors and variables (Wang & Rhemtulla, 2021; Al-Hawary & Al-Syasneh, 2020; Al-Adamat et al., 2020; Al-Gasawneh & Al-Adamat, 2020). Accordingly, the reliability and validity of the constructs were tested using confirmatory factor analysis (CFA) through the statistical program AMOSv24. Table 1 summarizes the results of convergent and discriminant validity, as well the indicators of reliability.

Table 1 shows that the standard loading values for the individual items were within the domain (0.572–0.911), these values greater than the minimum retention of the elements based on their standard loads (Al-Lozi et al., 2018; Sung et al., 2019). Average variance extracted (AVE) is a summary indicator of the convergent validity of constructs that must be above 0.50 (Howard, 2018). The results indicate that the AVE values were greater than 0.50 for all constructs, thus the used measurement model has an appropriate convergent validity. Rimkeviciene et al. (2017) suggested the comparison approach as a way to deal with discriminant validity assessment in covariance-based SEM. This approach is based on comparing the values of maximum shared variance (MSV) with the values of AVE, as well as comparing the values of square root of AVE ($\sqrt{}$AVE) with the correlation between the rest of the structures. The results show that the values of MSV were smaller than the values of AVE, and that the values of $\sqrt{}$AVE were higher than the correlation values among the rest of the constructs. Therefore, the measurement model used is characterized by discriminative validity. The internal consistency measured through Cronbach's Alpha

Table 1 Results of validity and reliability tests

Constructs	1	2	3	4	5	6
1. e-recruitment (ERC)	**0.757**					
2. e-development (EDV)	0.351	**0.737**				
3. e-performance evaluation (EPE)	0.375	0.355	**0.764**			
4. e-compensation (ECP)	0.418	0.468	0.458	**0.769**		
5. e-communication (ECM)	0.436	0.455	0.528	0.392	**0.774**	
6. employee satisfaction (ESA)	0.628	0.602	0.671	0.652	0.660	**0.771**
VIF	2.544	1.825	1.671	2.237	2.060	–
Loadings range	0.572–0.855	0.694–0.782	0.703–0.821	0.743–0.815	0.675–0.831	0.643–0.911
AVE	0.572	0.543	0.583	0.592	0.599	0.594
MSV	0.458	0.338	0.420	0.497	0.503	0.514
Internal consistency	0.836	0.854	0.871	0.877	0.879	0.918
Composite reliability	0.840	0.856	0.875	0.879	0.881	0.921

coefficient (α) and compound reliability by McDonald's Omega coefficient (ω) was conducted as indicators to evaluate measurement model. The results listed in Table 1 demonstrated that both values of Cronbach's Alpha coefficient and McDonald's Omega coefficient were greater than 0.70, which is the lowest limit for judging on measurement reliability (De Leeuw et al., 2019).

5.2 Structural Model

The structural model illustrated no multicollinearity issue among predictor constructs because variance inflation factor (VIF) values are below the threshold of 5, as shown in Table 1 (Hair et al., 2017). This result is supported by the values of model fit indices shown in Fig. 2.

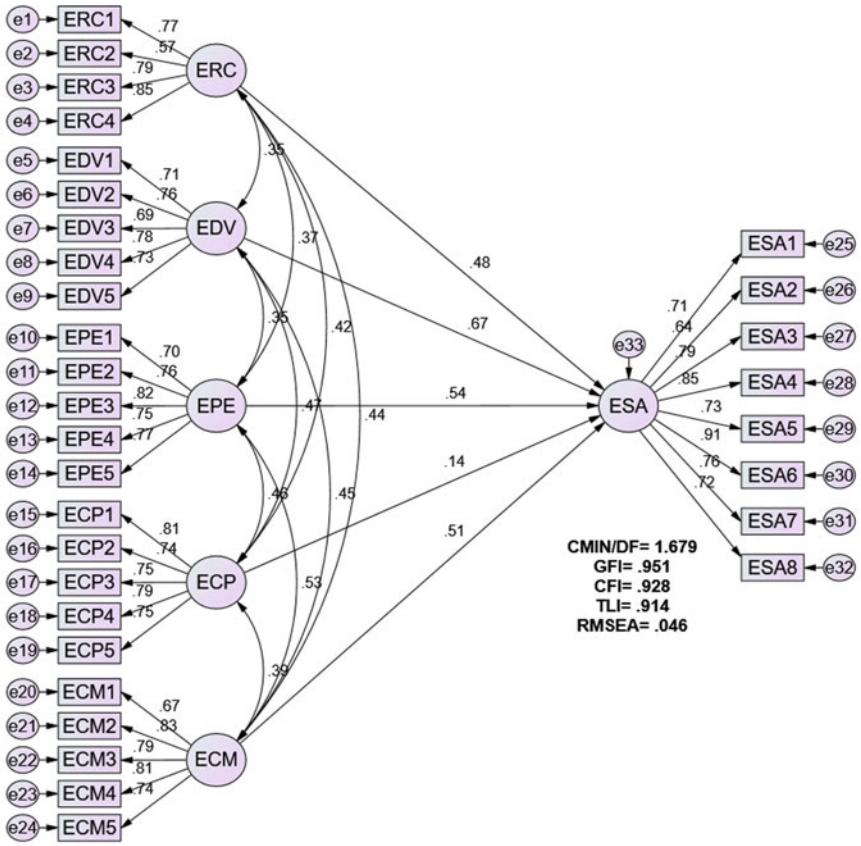

Fig. 2 SEM results of the e-human resource management effect on employee satisfaction

Table 2 Hypothesis testing

Hyp	Relation	Standard beta	t value	p value
H1	e-recruitment→employee satisfaction	0.485*	8.847	0.03
H2	e-development→employee satisfaction	0.671***	14.873	0.000
H3	e-performance evaluation→employee satisfaction	0.542**	10.597	0.002
H4	e-compensation→employee satisfaction	0.137	0.897	0.188
H5	e-communication→employee satisfaction	0.615***	13.042	0.000

Note * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

The results in Fig. 2 indicated that the chi-square to degrees of freedom (CMIN/DF) was 1.679, which is less than 3 the upper limit of this indicator. The values of the goodness of fit index (GFI), the comparative fit index (CFI), and the Tucker-Lewis index (TLI) were upper than the minimum accepted threshold of 0.90. Moreover, the result of root mean square error of approximation (RMSEA) indicated to value 0.046, this value is a reasonable error of approximation because it is less than the higher limit of 0.08. Consequently, the structural model used in this study was recognized as a fit model for predicting the employee satisfaction and generalization of its result (Ahmad et al., 2016; Shi et al., 2019). To verify the results of testing the study hypotheses, structural equation modeling (SEM) was used, the results of which are listed in Table 2.

The results demonstrated in Table 2 show that e-human resource management dimensions had a positive impact on employee satisfaction except e-compensation ($\beta = 0.137, t = 0.897, p = 0.188$). They also indicated that the highest impact was for e-development ($\beta = 0.671$, $t = 14.873$, $p = 0.000$), followed by e-communication ($\beta = 0.615$, $t = 13.042$, $p = 0.000$), then e-performance evaluation ($\beta = 0.542$, $t = 10.597$, $p = 0.002$), and finally the lowest impact was for e-recruitment ($\beta = 0.485$, $t = 8.847$, $p = 0.03$).

6 Results Discussion

The study concluded that electronic human resource management practices (selection and appointment, development, compensation and incentives, performance evaluation, communication) have a statistically significant impact on achieving employee satisfaction, which agreed with the findings of Khan et al. (2019), who found an impact of human resource management practices (selection and appointment, training and development, performance evaluation, communication) on achieving employee satisfaction. Employee satisfaction was also found to have a statistically significant effect on the electronic human resources management variable in the study. The reason for this could be that the systems that underpin electronic human resource management, such as electronic performance appraisal, protect the worker's right to be free from manipulation by others. This finding is in line with Atyani and Abu

Salmi's research (2014). In addition, the variables of polarization and computerized selection have a statistically significant effect on employee satisfaction. Electronic systems are utilized in the sorting of job applications in this activity, and advanced applications are sifted and applications that meet the standards and conditions are picked using electronically operated systems, because these systems are so vital in increasing employee satisfaction. Finally, the electronic training and development variable has a statistically significant effect on employee satisfaction. Electronic systems are used to teach new employees the skills they need to accomplish their jobs and to provide them with appropriate training based on their needs being closely monitored. Employee satisfaction is increased as the results of training programs are evaluated utilizing specific technological technologies. This finding is consistent with Ruël et al. (2004), who found that using computerized human resource management in the training process can help finish the training and development process at the lowest feasible cost.

The electronic performance evaluation has a statistically significant effect on employee satisfaction. Employee performance is reviewed using the Internet, and data on employee performance is collected using computerized systems in order to make judgments about promotions or determine training needs. This practice has the most impact compared to others. Because of the transparency that electronic performance appraisal systems provide. The benefit of electronic human resources management, according to Stone et al. (2006), contributes to the dissemination of information about employees and access by managers, the human resources department, and employees themselves, as well as the identification of job opportunities and performance feedback (Al-Dhuhouri et al., 2020; Odeh et al., 2021).

The electronic compensation variable has a statistically significant effect on employee satisfaction. Electronic programs determine the relative and compensating value of occupations, and employees are alerted about incentives electronically, demonstrating transparency among employees and so leading to employee satisfaction. Employee satisfaction is influenced by the electronic communication variable because each employee receives a personalized email from the company, which is intended to keep employees informed about changes to the company's rules and procedures. Employee happiness is a result of working hours that are determined by a prior agreement between them.

7 Recommendations

According to the study's findings, managers and decision-makers should follow the contract's implementation of all employee rights, as well as the employee's commitment to carry out all of the duties entrusted to him, ensure the employee's job stability, and work to ensure that an organization offers advanced technologies

based on employee performance evaluation, by making the most significant investment in contemporary technologies imaginable. Finally, electronic compensation mechanisms must be improved. Pay close attention to electronic human resource procedures, and place a strong emphasis on employee satisfaction, since this will help them work better.

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Employee Empowerment and Intention to Quit: The Mediating Role of Work Engagement: Evidence from the Information Technology Sector in Jordan

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Abstract The objective of this study to understands the role of work engagement as a mediator in the relationship between employee empowerment and intention to quit. A quantitative approach was adopted in order to achieve this study aim: 318 responses were collected via an e-questionnaire from the respondents belonging to IT sector employees in Jordan, one of the most significant Jordanian sectors. The Statistical Analysis Package for Social Science (SPSS) was used for data analysis, and the Sobel test was further used to assess the mediating impact of work engagement on the relationship between employee empowerment and employees' intentions to quit. Findings indicated that that work engagement has a mediating effect between employee empowerment and employees' intention to quit. In light of the

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_55

findings of this research, the most important recommendations include that information technology companies should focus on enhancing employee empowerment within organizations so that the employee becomes more affiliated and engaged in the organization in which they work. More future studies on empowerment, intention to quit and work engagement could be conducted in other organizations.

Keywords Work engagement · Intention to quit · Employee empowerment · Information technology · Jordan

1 Introduction

Empowering employees is one of the modern administrative trends in the growth of human resources, which is responsible for enhancing capability and competitiveness in organizations and enhancing quality and sustainability (Alshurideh et al., 2019; Al Khayyal et al., 2020). Empowered employees are in better position to make appropriate choices to solve particular problems on their own (Alhalalmeh et al., 2020; Al-Hawary et al., 2020; Andrew & Sofian, 2012; Mohammad et al., 2020). So, individuals who feel more efficient in their ability to perform the work successfully would be more satisfied in their work (Al-Lozi et al., 2018; Saks, 2006), be more committed and have less desire to leave their job (Al-Hawary & Alajmi, 2017; Shuck et al., 2011)., and show positive performance in their work, more than those individuals who have lower levels of empowerment (Al-Lozi et al., 2017; Meyerson & Kline, 2008).

Work engagement has become a very common concept and a topic of significant concern in management and psychology over the last 20 years. Getting an engaged workforce is a strategic advantage for organizations, as it is strongly associated with desirable organizational outcomes (Han, 2015; Yin, 2018). Organizations with high levels of work engagement increased earnings per share by 3.9 times more than those with low levels of work engagement (Alameeri et al., 2020; Gallup, 2010). Disengaged employees, on the other hand, cost organizations because they are less productive (Alyammahi et al., 2020; Richman, 2006). As a result, having engaged employees is regarded as the fourth most important management challenge facing business organizations (Al-Hawary & Al-Namlan, 2018; Aselstine & Alletson, 2006).

In the modern era, organizations strive to maintain talent and explore potential ways to enhance work engagement with their employees and teams (Al-Hawary,

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2015; Al-Hawary & Abu-Laimon, 2013). Hence, workforce stability is a powerful competitive strategy that is expected to become increasingly important in the future, and employees' intention to quit continues to be a topic of interest among management researchers (Al-Hawary et al., 2013; Metabis & Al-Hawary, 2013; Nuseir et al., 2021). Alfes et al. (2013) indicated that engaged employees tend to have less intention to leave their organizations.

"Employees' intention to quit," according to Fugate et al. (2012), is a very costly issue, especially when it is accompanied by cognitive withdrawal. The term "occupational stability" contrasts with the term "intention to quit" and means the survival and continuation of individuals in the same job for a long period (Agha et al., 2021; Whitebook & Sakai, 2003). Studying, in the Jordanian context, the impact of employee empowerment on employees' intention to quit is considered a necessary input to the process of promoting sustainable job opportunities, while reports received from individuals and organizations indicate that the rate of employees' intention to quit has a significant impact on organizational performance (AlShehhi et al., 2020; Kurdi et al., 2020). The rate of job turnover is a challenge to the workflow, given the time and effort needed by human resources employees to maintain employment levels and productivity in organizations (Abu Jadayil, 2011; Al Kurdi et al., 2020). From the review above, it can be concluded that, in spite of the volume of research on employee empowerment, intentions to quit, and work engagement, most such effort is still conceptual at best, confined to a limited, scope or lacks empirical testing (Alsuwaidi et al., 2020; Al Shebli et al., 2021; Al-bawaia et al., 2022). Hence, this research study aims to explore the impact of employee empowerment on intentions to quit, and to identify the role of work engagement as a mediator, in the rather unexplored context and.

2 Literature Review and Hypotheses Development

2.1 Employee Empowerment

Employee empowerment, according to Selvi and Maheswari (2020), is a process in which an organization's employees are given authority, power, responsibility, resources and liberty to make decisions and complete job responsibilities. It also grants employees control and allows for the distribution of responsibilities and control at all levels (Ammari et al., 2017). There is no doubt that attention to the concept of empowering employees constitutes an essential and decisive element for organizations in Jordan, especially in light of the trend towards adopting and applying modern administrative concepts, such as total quality management, re-engineering management processes and comprehensive performance planning (Alshurideh et al., 2015, 2020) Empowerment leads the individual to a sense of belonging to the organization, which in turn leaves positive effects on the employee's psyche and sense of importance and appreciation in the organization. Empowerment is seen as a way to

involve employees in the decision-making process, enrich their skills and experience, and establish a sense of their importance at work (Al-Hawary & Al-Syasneh, 2020; Moye & Henkin, 2006).

Employee empowerment contributes to changing the individual's perception and attitude towards their organization or their job (Ghaniyoun et al., 2017). Empowerment has been considered a vital subject in management recently. There is common support to grant employees adequate scope of freedom in their work meaning and responsibilities to enable them to apply this scope towards achieving the overall aims of the organization (Al-Dhuhouri et al., 2020; AlTaweel & Al-Hawary, 2021).

Due to the many dimensions of empowerment, and because of a dynamic process in a dynamic environment, and many elements involved in various steps of this process, empowerment is very complex to define (Al Mehrez et al., 2020; Al-Hawary & Alwan, 2016; Robbins et al., 2002). Conger and Kanungo (1988) defined empowerment as the motivating principle of self-efficacy, According to Khalili et al. (2016), empowerment is an administrative approach in which managers and other organizing members participate in influencing decision-making (i.e., decision-making cooperation). This definition is in line with that of Baird and Wang (2010, p. 577), who defined employee empowerment as "the delegation of power and responsibility from higher levels in the organizational hierarchy to lower level employees, particularly decision-making power."

Previous studies present many dimensions that can be used to measure empowerment within organizations. To achieve the purpose of our study, competence, impact, self-determination and meaning were used as dimensions to measure employee empowerment. These four perceptions together reflect a positive attitude towards work, and from that, empowerment is a motivating component that supports individuals and qualifies them to possess independent capabilities that enable them to make decisions commensurate with the goals of the organization (Al Suwaidi et al., 2020; Alaali et al., 2021). These dimensions are; **Meaning**, is related to the individual's sense of the importance of his/her work on a personal level and within the work environment (Zhang & Bartol, 2010). **Competence**, it is the individual's ability to perform tasks successfully and this refers to self-efficacy. **Self-Determination,** it has also been described as a feeling of control, freedom of choice, and self-determination to initiate action (Salman, 2015). **Impact**, it represents the degree to which the individual sees that his/her behaviour at work makes a difference in results (Zhang & Bartol, 2010).

2.2 Intention to Quit

Individual employees' plans to leave their jobs can be referred to as intentions to quit (Al-Hawary & Aldaihani, 2016; Al-Hawary & Nusair, 2017; Al-Hawary & Mohammed, 2017; Williams & Hazer, 1986); such intentions to quit can be either voluntary or involuntary. The biggest predictor of actual turnover is employees' intention to quit (Joseph et al., 2007) and the study of Williams and Hazer (1986)

indicates that there is a strong correlation between the employee's intention to quit work and the actual behaviour of quitting. We conclude from the foregoing that employees' intention to quit is defined as the individual's unwillingness to continue working, and decision to think carefully and seriously about leaving the job and trying to search for new job opportunities. intention to quit is one of the phenomena that have a high cost to the organization, and it crystallizes in two directions; the first is the decision to leave the work, which incurs large losses to the organization, and the second is the loss of morale among workers who decide to stay in the organization in the presence of these intentions (Odeh et al., 2021; Lee et al., 2022a, b). Based on the above, the study of intention to quit becomes one of the constants that the organization must study in order to avoid many material and moral costs.

2.3 Work Engagement

Successful organizations consider engagement to be important, and it is one of the hot topics highlighted in human resource management insights today. Some researchers refer to it as employee engagement, while others refer to it as work engagement. Even so, there is no difference between the two terms when it comes to explaining employee engagement. Employee engagement is a solution that managers can recommend when dealing with employees' motivation issues (Oehler & Adair, 2019; Alshurideh, 2019, 2022). Engagement was interpreted by Kwon and Park (2019) as an individual's mental, emotional, and cognitive condition that leads to the achievement of organizational goals. Hence, in occupational health psychology, work engagement is one of the most common outcomes (Lesener et al., 2020). Therefore, the issue of work engagement has become a topic that has captured the interest of many researchers and practitioners in the field of management and organizational behaviour, as it is a basic and decisive element in the success of business organizations (Garg & Singh, 2019).

Recent research showed high levels of disengagement from work, a situation that continues to cause problems for leaders around the world. Massive employee disengagement has recently been reported (Hewitt, 2013). According to Baron (2013), employee engagement is beneficial; engaged employees work harder, perform better, and provide better customer service, believe in the values of the organization, search and explore opportunities to improve organizational performance, can be relied upon and perform job requirements to the fullest, all of which led to improvement in the bottom line. Work engagement is described as involvement, commitment, enthusiasm, optimism, and energy, which stem from each employee's attitudes and behaviours in carrying out his or her responsibilities (Na-Nan et al., 2020).

Most researchers have dealt with work engagement as a three-dimensional construction, comprising: first, **vigour**, characterized by high levels of energy, mental resilience at work, investment in the performance of the tasks of the job, and perseverance in the face of difficulties; second, **dedication,** including the ability to solve work problems and awareness of work events and challenges (Chirkowska-Smolak,

2012); third, **absorption**, which refers to being fully focused, taking pleasure in being preoccupied with work and feeling the passage of time quickly (Cole et al., 2012).

2.4 Work Engagement as a Mediator

Work engagement has long been a source of interest for managers and researchers, who have discovered that it has a strong link to a variety of positive consequences, e.g., job satisfaction, financial returns, better productivity, lower intention to quit and employee innovation and creativity (Anderson, 2017; Polo-Vargas et al., 2019). Organizations depend heavily on the abilities and skills of their employees in a rapidly changing business environment. Where the competitive business environment is very high, engaged employees are essential for successful organizations that want to remain competitive; this requires individuals with dedication, absorption, energies and ambition; employees who are engaged have a plethora of "resources" to invest in their jobs (Karatepe et al., 2020). They are passionate about their job, completely immersed in their work activities, and tenacious when faced with obstacles. Work engagement is a crucial indicator of job effectiveness and organizational performance, according to several reports that distilled the average impact observed in hundreds of studies. Furthermore, recent research has shown that employee engagement contributes to key organizational outcomes, such as creativity and innovation, customer satisfaction, improved financial performance, and decreased turnover rate (Bakker & Leiter, 2017).

Work engagement and psychological empowerment are critical in coping with work-related deviations and improving organizational effectiveness (Ugwu et al., 2014). Stander and Rothmann (2010) analyzed the relationship between psychological empowerment, work engagement and job insecurity among employees working in a government and manufacturing organization. The findings show that job security, psychological empowerment, and work engagement all have significant connections between them. On the other hand, the study also revealed four dimensions of psychological empowerment (self-determination, competence, meaning, impact) that predict engagement (vigour, dedication and absorption) of the employee.

In the information technology (IT) sector, organizations get to be more powerful and stronger by increasing the employees' experience. Turnover, on the other hand, poses a threat to successful organizations since it results in the loss of skilled employees. It is also an additional expense for the organizations. As a result, the managers attempt to keep turnover to a minimum (Alshurideh, 2019; Alshurideh et al., 2012). However, the turnover intention must be handled in order to keep turnover under control. This is a difficult undertaking because there are so many factors that affect turnover intentions (Özkan, 2021). Based on the above literature review, the study hypotheses may be formulated as:

Work engagement of IT companies in Jordan significantly mediates the relationship between employee empowerment and employees' intention to quit.

3 Research Model

The systematic treatment of the research problem in light of its theoretical framework and field implications requires designing a hypothetical scheme that indicates the logical relationship between the research variables. First, the model assumes that a four-variable construct, consisting of meaning, impact, competence, and self-determination, represents employee empowerment. This model further asserts a directional relationship between the empowerment of workers and this construct. Second, the model assumes that work engagement is a compound of Vigour, dedication, and absorption of three variable constructs. In addition, this model states a directional correlation between work engagement and this construct. Third, the model assumes that (Employee empowerment) and work engagement have a directional relationship. In Fig. 1, the hypothesized ten variables are described in this model.

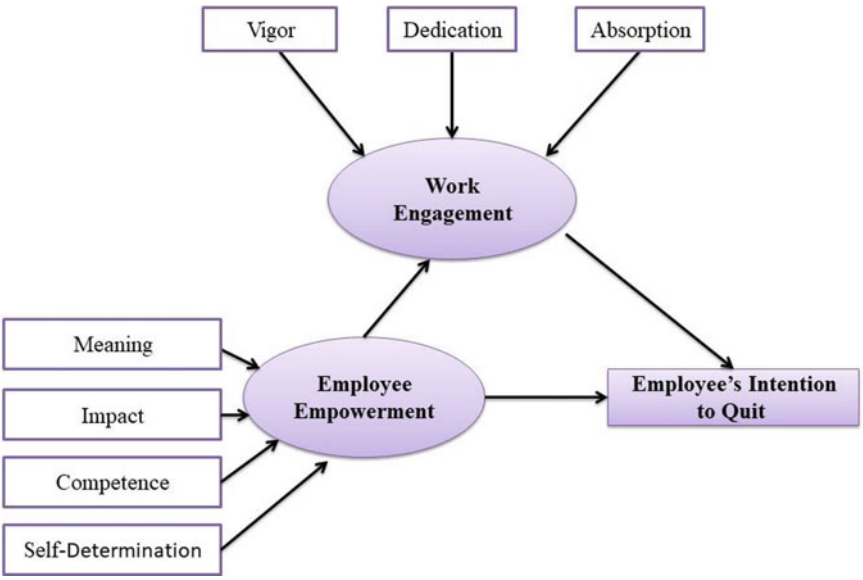

Fig. 1 Research model

4 Methodology

4.1 Population and Sample

The population in this study consisted of all IT employees working in IT companies that participated in this study, in Amman and the North of Jordan, with a total number of 1568. For the study sample, convenience sampling was used, which is a sort of non-probability sampling. Convenience sampling is a way of collecting research data from a conveniently available number of respondents who are easily accessible. An e-questionnaire was distributed, to which the response rate was 20%, with 318 questionnaires returned, while 312 questionnaires were valid for analysis.

4.2 Questionnaire Design

The researchers developed a questionnaire that covered all parts of the study variables. The questionnaire was based on previous studies in order to improve this study instrument; previously used statements were used in several studies (Dysvik & Kuvaas, 2010; Gim & Ramayah, 2020; Low & Spong, 2021), and thus their validity has been previously verified because they were used and achieved the desired results. The questionnaire was used as a basic instrument for collecting the necessary data to complete the study. The study tool was developed after reviewing the literature and studies related to the topic of employee empowerment, work engagement and intention to quit.

The study instrument consisted of four parts: Part One, Demographic data related to the study sample, including age, gender, educational level, years of experience, average weekly working hours, career level. Part Two, this is related to the independent variable represented by employee empowerment, which was measured in four dimensions (Meaning, Impact, Competence, Self-Determination), following Spreitzer (1995). Part Three, this relates to the mediating variable represented by work engagement, which was measured in three dimensions (Vigour, Dedication, Absorption), based on a scale from Schaufeli et al. (2002). Part Four, this relates to the dependent variable represented by the intention to quit (ITQ), which was measured based on a scale from Begley and Czajka (1993). A Likert scale method was employed from 1 (Strongly agree) to 5 (Strongly disagree) to measure all variables, except demographic variables.

Table 1 Cronbach's α values

Factors	Cronbach's alpha	Number of items
Employee empowerment	0.904	18
Competence	0.669	4
Impact	0.640	3
Meaning	0.715	4
Self determination	0.761	7
Work engagement	0.949	13
Absorption	0.818	4
Dedication	0.912	4
Vigour	0.879	5
Employees' intention to quit	0.839	9

4.3 Validity and Reliability

Content validity

The researcher also tested the validity of the questionnaire in order to identify the links to the questions and their relevance to the variables of the study, and to ensure the consistency of the answers of the sample members, in achieving the objectives of the study and answering its questions. The questionnaire was also reviewed by academic experts in the field from Yarmouk University; it took two weeks to complete the validity phase. After completing the face and content validity phase with academics, the researcher took corrections based on the recommendations of these scholars. The questionnaire after the content validity check. The questionnaire was then adjusted and revised according to their comments.

Instrument reliability

The reliability of the study tool was verified using the Cronbach's alpha reliability coefficient. The recommended reliability coefficient exceeds 0.70 according to Sekaran and Bougie (2016), while other researchers accept 0.60 as a cut-off point (Sekaran & Bougie, 2013; Al-Adamat et al., 2020; Al-Gasawneh & Al-Adamat, 2020). Cronbach's alpha was employed in this study to determine the research tool's reliability, as well as the consistency of the items with each other and with all items in general. This is illustrated in Table 1.

5 Analysis

The researcher employed the Sobel Test to examine whether work engagement mediates the relation between empowerment and intention to quit. Figure 2 indicates that

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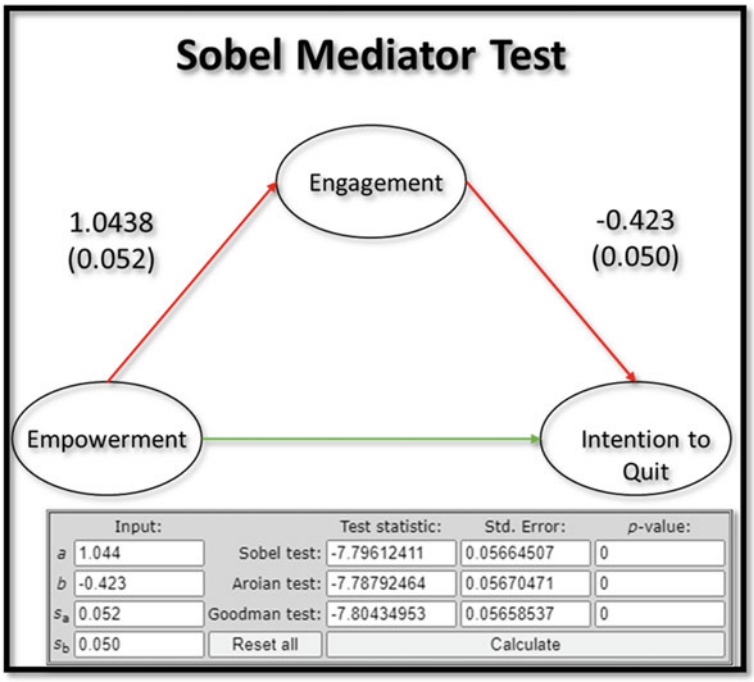

Fig. 2 Sobel mediator test

the indirect effect of empowerment on employees' intention to quit after work engagement is included in the model estimate is: Test statistic −7.79612411 and Std. Error 0.05664507; this result is significant, since the *p*-value is 0.000, which is less than 0.05. Thus, we accept the hypothesis that work engagement has a significant impact on mediating the relationship between empowerment and intention to quit at $\alpha \leq 0.05$.

6 Discussion

The purpose of this study is to determine the mediating role of work engagement on the relationship between the independent variable and the dependent variable. The information technology sector contributes significantly to national economies and employment (Thomas & Lucas, 2019). The researcher concludes that all participants have responded positively to all dimensions of the employee empowerment scale. This can be explained by highlighting the employees' awareness of the importance of their work and their confidence in performing their job tasks efficiently, as they possess all the skills and capabilities that qualify them to do so. Nevertheless, they do not feel a high level of self-determination in the job they do in their surrounding

environment. The researcher employed the Sobel Test to examine whether work engagement mediates the relation between empowerment and intention to quit. The study results showed the indirect effect of empowerment on employees' intention to quit after work engagement is included in the model estimate is Test statistic − 7.79612411 and Std. Error 0.05664507; this result is significant, since the *p*-value is 0.000, which is less than 0.05. To test the hypothesis that engagement mediates the relationship between empowerment and intention to quit, the Sobel test was used. The results show this hypothesis is validated and work engagement has a mediating effect between employee empowerment and intention to quit according to the Sobel test.

7 Recommendations and Direction for Future Research

In light of the results, the researcher makes some recommendations that she believes may contribute to enhancing and improving employee empowerment and work engagement in organizations in general and in information technology companies in particular: it is required from the Information technology companies to focus on enhancing the employee empowerment within organizations so that the employee becomes more affiliated and engaged in the organization in which he/she works, through working to enhance the dimensions of empowerment among employees, because of the positive impact of empowerment on improving work engagement, and to notifying the employee of the importance of the work they do and providing incentives and material and moral rewards to them in appreciation of their efforts, because of the importance of finding meaning in one's work and its positive impact on improving work engagement. Finally, to focus on developing the competence of employees by designing training programs that increase their skills and ability to do work, because of the importance of the dimension of competence and its positive impact on work engagement.

The current study examined the relationship between empowerment and the intention to quit work through the mediating variable of work engagement, and thus paves the way towards conducting more studies on empowerment and its relationship with other variables, such as creativity, employee well-being and work stress. And examining the relationship between empowerment and the intention to quit in other organizational contexts, such as the industrial sector and the health sector. Future studies can examine the relationship between work engagement and other variables, such as leadership, good citizenship behaviours, performance, and organizational justice. The researcher recommends conducting studies on different sectors for the same dimensions of this study and using different quantitative and qualitative methodologies to come up with results that can be generalized with greater confidence.

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Impact of Manufacturing Flexibility on Response to Customer Requirements of Manufacturing Companies in King Abdullah II Ibn Al Hussein Industrial City in Jordan

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Abstract This study aims to examine the impact of manufacturing flexibility on the response to customer requirements which is the dependent variable. This study was applied on 210 random samples of 458 manufacturing companies in King Abdullah II Ibn Al Hussein Industrial City. The researcher used the questionnaire tool to collect the primary data from the units of observation. The data was analyzed by using SPSS program. The study findings showed the impact of manufacturing flexibility

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_56

on response to customer requirements. The study recommends increasing of job rotations of employees among company's activities to amend labor flexibility.

Keywords Manufacturing flexibility · Response to customer requirements · King Abdullah II Ibn Al Hussein · Industrial city · Jordan

1 Introduction

In light of the rapid development that the world is witnessing in all life aspects and the increasing in the products and services diversity that did not exist in the past, the pressure on business organizations has increased in their race to meet this diversity as much as possible in a way that reflects positively on the business organization and preserves it from decline (Al-Hawary & Al-Syasneh, 2020; Al-Hawary & Obiadat, 2021; Al-Nady et al., 2013; AlTaweel & Al-Hawary, 2021). Therefore, many business organizations are making rapid and continuous changes in order to respond to developing or changing products and diversifying them to adapt to the world new situation and to enhance their competitive position, this leads organizations to activating a competitive weapon that depends on their ability to deal with variables, which is manufacturing flexibility (Al-Nady et al., 2016; Allahow et al., 2018; Al Kurdi et al., 2020a, b).

The most important thing for business organizations today is their ability to meet customer's requirements, and one of the means to achieve this is by providing high product diversity in the least amount of time while maintaining or improving quality and reducing costs (Al-Hawary, 2013; Al-Hawary & Abu-Laimon, 2013; Al-Hawary & Al-Menhaly, 2016; Al-Hawary & Al-Smeran, 2017; Al-Hawary & Harahsheh, 2014; Al-Hawary & Hussien, 2017; Al-Hawary et al., 2013, 2017; Alolayyan et al., 2018; Alshurideh et al., 2017; Metabis & Al-Hawary, 2013). Therefore, manufacturing flexibility represented by (machines flexibility, product mix flexibility, new product flexibility, labor flexibility, operations flexibility, process flexibility) is a weapon with which organizations face changes in customer requirements. As for Jordan, which has adopted the economic openness option, Jordanian business organizations today find themselves forced to keep pace with the development they have made in order to continue in the market and maintain their market position.

The study importance comes from the importance of responding to customers' requirements by industrial companies because of their essential role in developing, improving and preserving the company from failure if it cannot meet these requirements in a timely manner (Ahmed et al., 2020; Ahmad et al., 2021a, b; Odeh et al., 2021). In addition to manufacturing flexibility importance in meeting the change in products according to circumstances, times and places, especially with the increase

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of requirements changes in recent times, the most recent of which was during the Corona Virus (COVID-19) crisis, which impact has become clear on all life aspects, including industrial companies (Alameeri et al., 2021; Nuseir et al., 2021; Taryam et al., 2020). It should be noted here that some companies responded quickly to the changes accompanying this crisis, which reflected positively on their position and market share (Alshurideh et al., 2021a, b, c; Khasawneh et al., 2021a, b; Leo et al., 2021).

The application of this study to the companies of King Abdullah II Ibn Al-Hussein Industrial City is of special importance, as it is considered the oldest industrial city in Jordan, as it was built in 1984 and is considered the largest industrial gathering in the Kingdom, where companies number reached 458 industrial companies, according to the Industrial Cities Company Jordanian website, this reflects its influential role in developing the Jordan economy. It was found by the study literature reviewing that there is a lack of studies that dealt with the relationship between manufacturing flexibility and its variables and its impact on the speed, flexibility and reliability of responding to customer requirements. And after the spread of Corona virus globally and the subsequent changes in consumer behavior and the sudden change in the humans' requirements in general, this is a strong test of the extent to which the manufacturing flexibility in companies affects the speed response to the sudden change in demands.

Responding to customers requirements and needs is a familiar slogan for many companies and one of the most important things that companies do by following them in order to continue their development and success in their work (Al-Hawary & Alhajri, 2020; Altarifi et al., 2015; Mohammad et al., 2020; Williamson, 1991). Manufacturing flexibility is becoming an increasingly important ability to design and operate manufacturing systems, as these systems operate in highly variable and unpredictable environments (Ghannajeh et al., 2015; Al-Dhuhouri et al., 2020; Alsuwaidi et al., 2020). When looking at previous studies on the issue of manufacturing flexibility, we find that most of them dealt with the impact of manufacturing flexibility on production, cost or performance, as in the study of Alsada and Allawi (2017) and (Kumar et al., 2017), and did not link manufacturing flexibility with responding to customers' requirements (Alkitbi et al., 2020; Alshamsi et al., 2020; Sweiss et al., 2021). This study came to find the effect of manufacturing flexibility with responding to customer's requirements.

2 Literature Review and Hypotheses Development

2.1 Manufacturing Flexibility

Continuous developments in manufacturing systems technology have made operations more capable, efficient and flexible to meet changing requirements and this has been particularly evident in the automotive industry. Operations are not longer

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limited to the production of a single product but can continually adapt to a range of products and demands. Flexibility of the production process has become an inevitable necessity imposed by the competition that characterizes the contemporary business environment, as a prerequisite for achieving business strategic goals of survival and growth. In light of the modern technology use, this aims to reduce unused energy by using automation, as the use of flexibility in manufacturing works to exploit idle energy. As for manufacturing flexibility concept, it was defined by Zhang et al. (2003) as the organization's ability to manage production resources and cases of meeting different customer demands uncertainty.

Daoud and Jawad (2016), defined manufacturing flexibility as the organization's ability to respond or adapt to the environment changes, and it can enhance the company's competitive performance by providing a variety of products that meet customers different tastes quickly while maintaining the production system performance. Ojstersek and Buchmeister (2020) defined it as the ability of a manufacturing system to respond effectively and efficiently to uncertain surrounding changes (manufacturing system and global demand). Accordingly, manufacturing flexibility can be defined as the organization's ability to interact with external or internal changes that occur suddenly or can be predicted, through the use of available resources quickly and using the least effort and expenses possible to meet customers demand (Al Mehrez et al., 2020; Alshurideh, 2019, 2022; Alzoubi et al., 2022; Tariq et al., 2022a, b).

Several researchers dealt with different manufacturing flexibility dimensions, where Gregory et al. (2019) took eight dimensions of manufacturing flexibility, while Daoud and Jawad (2016) addressed four dimensions of manufacturing flexibility, and Upton (1994) identified fifteen dimensions of manufacturing flexibility, which are: Production path flexibility, product flexibility, mix flexibility, activity flexibility, status flexibility, scale flexibility, program flexibility, long-run and short-run flexibility, stretch flexibility, machine flexibility, labor flexibility, design change flexibility, operational flexibility, and process flexibility. As for Benjaafar and Ramakrishman (1996), they differentiate between the different types of flexibility as they are divided into product flexibility and process flexibility; the first refers to a variety of factory options for a particular product. While process flexibility, is defined as one of the characteristics of an industrial process to work under various dynamic operating conditions. The researcher has chosen six dimensions of manufacturing flexibility from the dimensions identified by (Upton), which are the most appropriate to the researched companies' nature, and they are as follows: **Machine Flexibility**: Machine flexibility is one of the most fundamental and important dimensions of manufacturing flexibility that many researchers have discussed. It has been defined as the ability to make changes to the machine system with minimal interference in production (Gregory et al., 2019). **Labor Flexibility** which is the ability to multitask a labor, operator, or human resource within the manufacturing system without affecting efficiency (Kumar et al., 2017). **New Product Flexibility**: which is the company's ability to bring new parts and products to market in response to a changing business environment (Alamro, 2014). **Product Mix Flexibility**: This means that the mix of items delivered to the market can be changed quickly while maintaining cost-effectiveness, which achieved when product and process flexibility achieved together.

Process Flexibility: which is the ability to change the steps required to complete a required task, allowing the system to complete many tasks (Gregory et al., 2019). Process flexibility in a manufacturing system is related to the range of parts types that the system can produce without major preparation processes. **Operation Flexibility**: is a property of the part, and it means that the part can be produced with alternative process plans, where the process plan means a series of operations required to produce the part.

2.2 Responding to Customer Requirements

A customer is that person who buys something, whether goods or services, and is thus a customer of a company that sells products for making a profit purpose. As for customer requirements according to the researcher, is the characteristics or specifications that must be available in the product or service in order to receive approval from customers (Alshurideh et al., 2012; Alzoubi et al., 2020; Al-Dmour et al., 2021b; Abuhashesh et al., 2021). It is divided into two types: Service requirements: These are the intangible aspects of the purchased product that the customer expects to occur, such as delivery on time, good dealing with the seller when purchasing, ease of payment, and so on (Al-Dmour et al., 2021a; Alshurideh et al., 2021a, b, c). Final good requirements: which are the tangible characteristics, features, or specifications that the consumer expects to find in the product or service.

As for responding to customer requirements, it is often seen as a flexible response, but the response must be characterized by reliability and speed. Responsiveness is defined as encompassing the full range of values related to timely product development and delivery, as well as reliable scheduling and flexible performance (Heizer et al., 2017). Flexible responsiveness may be seen as the ability to adapt to changes in a market where design innovations and volumes fluctuate wildly. Heizer et al. (2017) defined response speed as speed in product development, speed in production, and speed in delivery. speed response to the customers' requirements and needs can be raised by reducing the time to deliver products to the market, reducing the time of the product manufacturing cycle, reducing the customer cycle time, and reducing the time of operations conversion or change.

2.3 Manufacturing Flexibility and Responding to Customer Requirements

Many managers see flexibility not as the end but as a means to many ends. As managers view flexibility as a tool for improving manufacturing as it is an essential component of the production process, it must be developed until the best production is reached. Daoud and Jawad (2016) studied the impact of manufacturing flexibility

in achieving competitive advantage and found that the level of manufacturing flexibility positively affects the competitive advantage, and the company's abilities to achieve competitive advantage represented by increasing interest and developing manufacturing flexibility. Zhang et al. (2003) explain Strong, positive, and direct relationships between flexible manufacturing efficiency and volume flexibility, and flexible manufacturing efficiency and mix elasticity. Size Flexibility and product mix flexibility have strong, positive, and direct relationships with customer satisfaction. As customers want a quick response and a variety of updated products and competitors achieve higher performance levels than were considered possible a few years ago, manufacturing flexibility, above all other measures of manufacturing performance, is cited as a solution. More flexibility in manufacturing processes means more ability to move with customer needs, respond to competitive pressures and move closer to the market (Slack, 2005). Accordingly, the research hypothesis can be formulated as follows:

There is a statistically significant impact of manufacturing flexibility on responding to customers' requirements in industrial companies in King Abdullah II Ibn Al Hussein Industrial City.

3 Study Model

See Fig. 1.

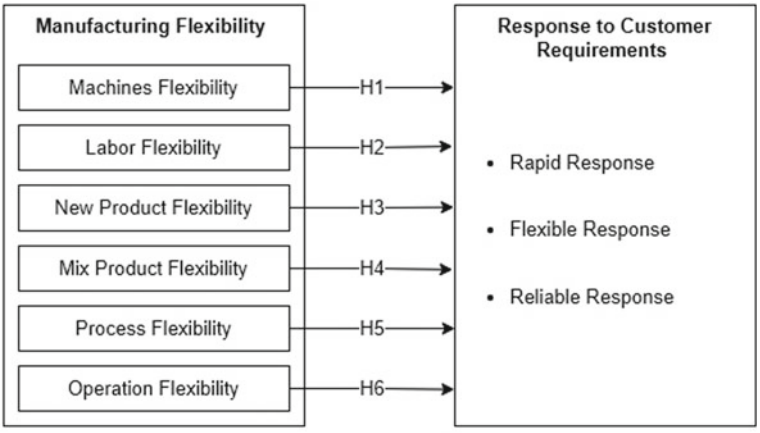

Fig. 1 Research model

4 Methodology

4.1 Population and Sample Selection

A qualitative method based on a questionnaire was used in this study for data collection and sample selection. The major aim of the study was to examine the impact of manufacturing flexibility on response to customer requirements. Therefore, it focused on manufacturing companies in King Abdullah II Ibn Al Hussein industrial city in Amman. Data were primarily gathered through self-reported questionnaires creating by Google Forms which were distributed to a random sample of (250) respondents via email. In total, (210) responses were received including (22) invalid to statistical analysis due to uncompleted or inaccurate. Hence, the final sample contained (188) responses suitable to analysis requirements that were formed a response rate of (89.5%), where it proved to be sufficient to the extent that was predictable and allowed for a presumption of data saturation (Sekaran & Bougie, 2016).

4.2 Measurement Instrument

A self-reported questionnaire that consists of two main sections along with a section regarding control variables was used as the measurement instrument. Control variables considered as categorical measures were composed of gender, age group, educational level, and experience. The two main sections were dealt with a five-point Likert scale (from 1 = strongly disagree to 5 = strongly agree). The first section contained (31) items to measure manufacturing flexibility based on (Upton, 1994). These questions were distributed into dimensions as follows: five items dedicated for measuring machines flexibility, six items dedicated for measuring labor flexibility, five items dedicated for measuring new product flexibility, six items dedicated for measuring mix product flexibility, four items dedicated for measuring process flexibility, and five items dedicated for measuring operation flexibility. Whereas the second section included (12) items developed to measure response to customer requirements according to what was pointed by (Al-Hawary & Hussien, 2017). This variable was a second-order construct divided into three first-order constructs. Rapid response measured by four items, flexible response measured through four items, and reliable response measured using four items.

5 Findings

5.1 Measurement Model Evaluation

This study was conducted structural equation modeling (SEM) to test hypotheses, which represents a contemporary statistical technique for testing and estimating the relationship between factors and variables (Wang & Rhemtulla, 2021). Accordingly, the reliability and validity of the constructs were tested using confirmatory factor analysis (CFA) through the statistical program AMOSv24. Table 1 summarizes the results of convergent and discriminant validity, as well the indicators of reliability.

Table 1 shows that the standard loading values for the individual items were within the domain (0.664–0.8871), these values greater than the minimum retention of the elements based on their standard loads (Al-Lozi et al., 2018; Sung et al., 2019). Average variance extracted (AVE) is a summary indicator of the convergent validity of constructs that must be above 0.50 (Howard, 2018). The results indicate that the AVE values were greater than 0.50 for all constructs, thus the used measurement model has an appropriate convergent validity. Rimkeviciene et al. (2017) suggested the comparison approach as a way to deal with discriminant validity assessment in covariance-based SEM. This approach is based on comparing the values of maximum shared variance (MSV) with the values of AVE, as well as comparing the values of square root of AVE ($\sqrt{}$AVE) with the correlation between the rest of the structures. The results show that the values of MSV were smaller than the values of AVE, and that the values of $\sqrt{}$AVE were higher than the correlation values among the rest of the constructs. Therefore, the measurement model used is characterized by discriminative validity. The internal consistency measured through Cronbach's Alpha coefficient (α) and compound reliability by McDonald's Omega coefficient (ω) was conducted as indicators to evaluate measurement model. The results listed in Table 1 demonstrated that both values of Cronbach's Alpha coefficient and McDonald's Omega coefficient were greater than 0.70, which is the lowest limit for judging on measurement reliability (De Leeuw et al., 2019).

5.2 Structural Model

The structural model illustrated no multicollinearity issue among predictor constructs because variance inflation factor (VIF) values are below the threshold of 5, as shown in Table 1 (Hair et al., 2017). This result is supported by the values of model fit indices shown in Fig. 1.

The results in Fig. 2 indicated that the chi-square to degrees of freedom (CMIN/DF) was 2.716, which is less than 3 the upper limit of this indicator. The values of the goodness of fit index (GFI), the comparative fit index (CFI), and the Tucker–Lewis index (TLI) were upper than the minimum accepted threshold of 0.90. Moreover, the result of root mean square error of approximation (RMSEA) indicated

Table 1 Results of validity and reliability tests

Constructs	1	2	3	4	5	6	7	8	9
1. MAF	**0.749**								
2. LAF	0.312	**0.774**							
3. NPF	0.297	0.318	**0.759**						
4. MPF	0.336	0.361	0.310	**0.761**					
5. PRF	0.374	0.338	0.375	0.394	**0.768**				
6. OPF	0.402	0.394	0.413	0.305	0.341	**0.757**			
7. RAR	0.512	0.487	0.526	0.425	0.624	0.533	**0.765**		
8. FLR	0.556	0.602	0.597	0.554	0.571	0.509	0.625	**0.775**	
9. RER	0.571	0.597	0.555	0.498	0.592	0.579	0.614	0.622	**0.767**
VIF	2.014	1.664	1.974	1.535	2.487	2.645	–	–	–
Loadings range	0.681–0.801	0.731–0.825	0.694–0.849	0.674–0.871	0.715–0.855	0.715–0.834	0.664–0.825	0.731–0.854	0.715–0.831
AVE	0.561	0.599	0.576	0.579	0.590	0.573	0.586	0.601	0.588
MSV	0.418	0.513	0.467	0.435	0.406	0.502	0.458	0.511	0.429
I.C	0.862	0.897	0.869	0.890	0.848	0.867	0.846	0.855	0.849
C.R	0.864	0.900	0.871	0.891	0.851	0.870	0.849	0.857	0.851

Note MAF: machines flexibility, LAF: labor flexibility, NPF: new product flexibility, MPF: mix product flexibility, PRF: process flexibility, OPF: operation flexibility, RAR: rapid response, FLR: flexible response, RER: reliable response, I.C: internal consistency, C.R: composite reliability

to value 0.056, this value is a reasonable error of approximation because it is less than the higher limit of 0.08. Consequently, the structural model used in this study was recognized as a fit model for predicting the response to customer requirements and generalization of its result (Ahmad et al., 2016; Shi et al., 2019). To verify the results of testing the study hypotheses, structural equation modeling (SEM) was used, the results of which are listed in Table 2.

The results demonstrated in Table 2 show that manufacturing flexibility dimensions, which were new product flexibility ($\beta = 0.368, t = 4.305, p = 0.000$), machines flexibility ($\beta = 0.202$, $t = 2.469$, $p = 0.014$), and operation flexibility ($\beta = 0.177$, $t = 2.146$, $p = 0.033$) had impact on response to customer requirements. Despite, the results indicated that labor flexibility ($\beta = 0.088$, $t = 1.240$, $p = 0.216$), mix product flexibility ($\beta = 0.047$, $t = 0.530$, $p = 0.597$), and process flexibility ($\beta = 0.006$, $t = 0.064$, $p = 0.949$) had no impact on response to customer requirements.

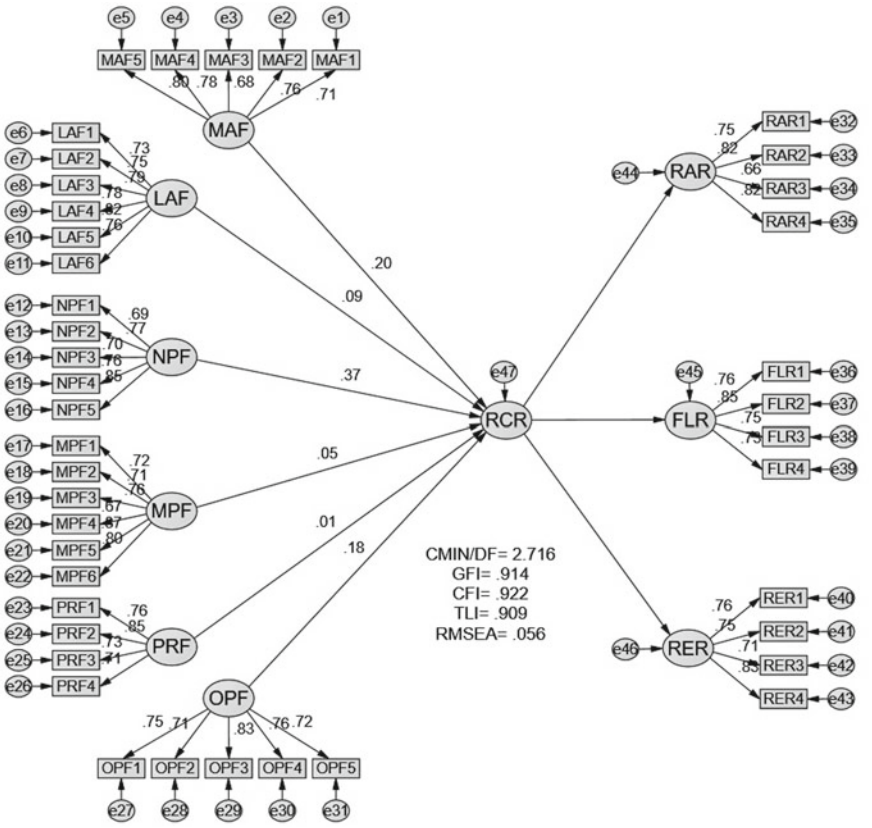

Fig. 2 SEM results of the manufacturing flexibility effect on response to customer requirements

Table 2 Hypothesis testing

Hypothesis	Relation	Standard beta	*t* value	*p* value
H1	MAF → RCR	0.202	2.469*	0.014
H2	LAF → RCR	0.088	1.240	0.216
H3	NPF → RCR	0.368	4.305***	0.000
H4	MPF → RCR	0.047	0.530	0.597
H5	PRF → RCR	0.006	0.064	0.949
H6	OPF → RCR	0.177	2.146*	0.033

Note MAF: machines flexibility, LAF: labor flexibility, NPF: new product flexibility, MPF: mix product flexibility, PRF: process flexibility, OPF: operation flexibility, RCR: response to customer requirements, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

6 Discussion

The study results showed that the nature of the used machines in the researched companies is characterized by ease of preparation and configuration as a result of the extensive use of advanced technology in manufacturing, which in turn helps in the goods production in appropriate quantities that correspond to the customers' demand quantity. Also, the machines used in manufacturing can be operated in certain mechanisms, which contribute to increasing production, while reducing the time needed to modify the process on the machine, and this indicates those machines flexibility and their ability to produce well in addition to saving worker time and effort.

Study results revealed the multiplicity of skills and experiences possessed by workers in King Abdullah II Ibn Al Hussein Industrial City, their experience levels, and their obtaining the appropriate academic qualifications that qualify them to perform various tasks at low costs and within the company's capabilities. The company's various needs also require its production lines to move employees from one site to another according to the company's production need, production type, or required expertise type, to remain and compete in the market, and to provide employees with diverse skills and experiences. This is in line with Bernardes and Hanna (2008) study which showed that systems allow change within predetermined parameters and response usually refers to system behavior that involves purposeful change in time.

Study results show the companies' desire to go in line with the market demand, and to cover that demand in light of the necessary machinery and equipment availability, as well as the participation of their employees and their concerted efforts in order to reach good production levels, and diversification in products to achieve success in introducing different products types to the market, and satisfy consumers' desires and needs as well. Results also indicated the companies' desire to maintain production and competition with products and the desire to improve performance, and this result could also be due to the availability of many experiences and workers scientific qualifications in those companies, which can determine the ability to perform many

operations on the same production line, as well as the desire through the workers in these companies to interact and achieve higher production levels, and all these factors help in increasing the production levels.

The study results also show the workers ability to maintain the production processes level, and this is also due to the nature of the machines and equipment used, and their accuracy in work and production, and also for drawing plans in production processes an important role in maintaining the products' types, and maintaining the cost as well. The study also revealed the companies' desire for competition and continuity in the markets, and to work on the development and modernization of products issued by industrial companies operating in King Abdullah II Ibn Al Hussein Industrial City. Also, companies must take into account all customers' requirements in their main objectives. The reason for the high response level among companies may be attributed to raising the competition level they have with other companies, and raising the trust level between companies and customers, which is beneficial to companies' sustainability and continuity, maintaining their level, and employing the largest possible number of working employees, who are the ones who help provide market and customer requirements.

Study results were clear, showing the existence of an impact of manufacturing flexibility application in its dimensions (machine flexibility, new product flexibility, and operating flexibility) in responding to customer requirements in industrial companies in King Abdullah II Ibn Al Hussein Industrial City. The reason for this may be the companies' high professionalism work and their follow-up to the development and used equipment and machines modernization, and also due to the companies providing new products to the markets on a permanent basis, which covers the changed consumer's need, This is also due to enabling companies to produce many multiple products at the same time to cover all consumers tastes and desires, and the reason for the effect may also be due to carrying out many operations on the same production line, and the possibility of changing the steps and processes necessary to produce a particular product easily, and within the specified time With the provision of efforts in light of providing many workers capabilities and experiences, as well as the clear impact of operating flexibility by setting manufacturing plans and goals, and intensively ensuring coverage of market requirements with all its elements, as traders and consumers, this results agreed with the results of Daoud and Jawad (2016), study which confirmed the existence of an impact of manufacturing flexibility in achieving competitive advantage.

The study also showed that there is no impact on the dimensions of manufacturing flexibility (labor flexibility, product mix flexibility, and process flexibility) in responding to customers' requirements. It is worth noting that it is noted that the relationship between the flexibility of the product mix and the response to customer requirements, although it did not reach the statistical significance level, but it is inverse, and this may be due to the fact that some of the measures taken in one of the dimensions of manufacturing flexibility may negatively affect other dimensions.

7 Recommendations

In light of the results and their discussion, the study recommends reducing the time spent when switching from one process to another on the same machines. And the increase in the employee's turnover rate within the company's various activities, which ensures an increase in the employment flexibility, and work to organize and speed up time, to introduce new products to the market. The study also recommends training workers to raise their skills to move from producing a specific product to producing another product quickly, and training workers to change the process on the same machine quickly and in a short time, taking care of developing several operations plans for each manufacturing process, so that the course of operations can be changed to produce a product when a machine malfunctions or is unable to operate it for any reason.

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Impact of Strategic Vigilance on Competitive Capabilities in Jordanian Insurance Companies

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Abstract The study aimed to identify the effect of strategic vigilance on competitive capabilities in Jordanian insurance companies. The study population included (288) individuals, who are the managers of the upper and middle level at the Jordanian insurance companies, which are (24) companies. The study sample is chosen from study population and this sample was chosen by equal stratified random method, which is estimated at (167) respondent according to the sample selection schedule. The questionnaire was used as a tool for the study, the final sample was consisted of

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_57

(138) individual. Two statistical analysis programs (IBM SPSS 24) (SMARTPLS, v. 3.2.6) to analyze the study data and test its hypotheses. The study showed a statistically significant impact of the strategic vigilance on competitive capabilities in Jordan insurance companies. According to the results, the study recommended the need to enhance interest strategic vigilance information in Jordanian insurance companies through the establishment of units and departments for the strategic vigilance in them, as they are important as strategic information resource.

Keywords Strategic vigilance · Competitive capabilities · Insurance companies · Jordan

1 Introduction

Business organizations are currently witnessing large and rapid developments, because they operate within their external environment, as they are affected and affected by them, and as a result, organizations must keep pace with these developments on an ongoing basis to ensure their continuity and survival (Al-Nady et al., 2016; Allahow et al., 2018; Al-Hawary & Obiadat, 2021; AlTaweel & Al-Hawary, 2021). The concept of strategic vigilance with its various dimensions (environmental, technological, competitive, and marketing) has played a major role in this field because it provides the organization with a strategic ability to ensure its survival within the successful business system. And because organizations are naturally working to achieve profits and enhance their marketing and competitive capabilities, this has had a significant impact by linking the strategic vigilance process to creating a state of enhancing their competitive capabilities, which in turn achieves organization overall goals (Alaali et al., 2021; Al-Hawary & Al-Hamwan, 2017; Al-Hawary & Al-Syasneh, 2020). It enhances its competitive capabilities in its various dimensions, it has become imperative for organizations to create and adopt competitive capabilities that are unique from their competing organizations (Altamony et al., 2012; Ahmad et al., 2021; Shamout et al., 2022; Tariq et al., 2022), and these capabilities and mechanisms for exploiting and applying may differ from one organization to another, and because this era is the information age, many organizations have adopted the idea of information searching proactively to develop their competitive capabilities, and because Information is the main source that enables organizations to stay in the field of competition and thus continuity (Al-Nady et al., 2013; Al-Hawary & Alwan, 2016; Alzoubi et al., 2021; Kabrilyants et al., 2021). Business organizations are looking for information in their internal and external environments to reach a high level of competitiveness and create added value for their products and services (Alshurideh, 2022; Alzoubi et al., 2022; Svoboda et al., 2021). The study importance appears in the fact that it deals with two important variables of management, strategic vigilance plays the role of a stimulus to ensure the organization survival in conducting business and competition, while competitive capabilities may contribute

to organization market share raising by exploiting the available market opportunities and avoiding threats and thus raising profitability levels.

The studied insurance companies in Jordan face intense competition, as each company seeks to attract the customer, meet his needs, and achieve his desires and aspirations, for this reason, Jordanian insurance companies must strengthen attention to strategic vigilance in order to develop competitive capabilities, considering that it is one of the mainstays to establish the competition rules, thus giving it a competitive position that makes it able to overcome the competitors threats. Through this study, the researcher tries to identify competitive capabilities and highlight their important role in creating an added value for the organization, which would guarantee it an advanced position among business organizations (Al Kurdi et al., 2020a, b; Alshurideh et al., 2020; Alzoubi et al., 2020; Al-Dmour et al., 2021; Ghazal et al., 2021; Alshurideh et al., 2022).

2 Literature Review and Hypotheses Development

2.1 Strategic Vigilance

The idea of building and integrating vigilance with strategy came as an extension of several previous concepts such as strategy first and then strategic planning to strategic management and finally the idea of smart organizations. Where strategic vigilance is one of the means that enables organizations to reach the strategic intelligence, organizations with the great developments taking place in the technical and technological sector have become interested in reaching a high stage of administrative and strategic intelligence, as strategic intelligence depends largely on the strategic vigilance process out puts. It is represented in monitoring the environment and collecting proactive information about it in order to use it to achieve the organization strategic objectives of the organization (Al-Hawary & Ismael, 2010; Mouloud, 2014; Al-Hawary & Hadad, 2016). Thus, the strategic vigilance concept came to enhance these axes in a smarter way by not being satisfied with information that is easy to notice, but rather searching for information in a proactive and conscious manner to remove ambiguity from the organization's work environment and, in turn, build a safe future for its continued performance in an effective manner (Zu'bi et al., 2012; Al-Hawary et al., 2013; Morabiti & Ben Tafat, 2016; Aburayya et al., 2020a, b).

Based on the foregoing, strategic vigilance is defined as the organizations race to obtain information through which organizations can listen to their external environment in order to open the appropriate opportunities to exploit them, and to monitor and avoid risks to reduce their effects, this process includes the collection, analysis and dissemination of strategic information with the aim of feeding strategic decisions, which, in turn, contributes to making strategic decisions for the organization (Sahnoun, 2018), On the other hand, Hajar (2018, 27) defined it as an organization that seeks to know the business environment and anticipate changes. It is an

informational process through which organizations listen to their environment in order to be able to make decisions. This process is classified within the information systems group that allow managers to lead in difficult times, and the strategic vigilance process can be considered as a system consisting of sub-systems affected by information flows coming from its overall environment. Decision makers must keep pace with changes and adapt to them, and this can only be done through several activities, including strategic vigilance. Competitiveness is no longer based only on reducing costs, but on the speed of response and adaptation to the large and rapid changes taking place in the dynamic work environment of organizations, in addition to the fact that the proper and proactive analysis of environmental signals avoids the organization from any upcoming danger and leads it towards exploiting the opportunities coming from its external environment (Alhalalmeh et al., 2020; Al-Lozi et al., 2017, 2018). Through vigilance concept, many different types and concepts of vigilance emerge. Researchers have differed about the classifications of strategic vigilance according to the purpose for which this strategic system is to be applied (Zhou et al., 2019; Alshurideh et al., 2019; Alameeri et al., 2020).

Marketing vigilance: The concept of marketing (commercial) vigilance is considered one of the modern and advanced concepts in the field of strategic management and in the field of marketing alike. Rapid technological developments and environmental challenges facing business organizations, organizations must be keen to realize, follow up, monitor and confront these changes and conflicts occurring in their environment. Marketing, as organizations must create a database of the marketing environment in order to take the necessary measures and take precautions and caution.

Competitive vigilance: Also known as competitive inquiry, it is the process through which the organization identifies its current and potential competitors, as it studies the environment in which competing organizations live by collecting and analyzing information and then extracting the results and applying them in making decisions. It also allows the organization to build a solid information base that enables it to study competitors deeply.

Technological vigilance: Technological vigilance has been defined as the organized effort by the organization to monitor, receive, analyze, re-publish and retrieve accurate and comprehensive information about certain events, as it contributes to the appropriate and accurate distribution of information within the organization for the purpose of using it in decision-making. As it helps to face rapid technological changes and monitor technological change in a proactive and orderly manner, which contributes to the organization's survival on the safe side of any rapid technological threat that may threaten its survival.

Environmental vigilance: Environmental vigilance is concerned with the remaining factors of the organization external environment that were not addressed by the previous types of vigilance, and of course they are no less important than the previous types, and from the types of environmental vigilance (social vigilance, economic vigilance, and political and legislative vigilance). Environmental vigilance has been defined as monitoring all developments that could affect the organization's activity and that were not taken into account in the previous types.

2.2 Competitive Capabilities

Competitive advantage is one of the organizational performance measurements (Al-Hawary, 2011, 2013; Al-Hawary & Abu-Laimon, 2013; Al-Hawary & Al-Namlan, 2018). It is the organization's ability to provide products and services more efficiently and effectively compared to other competing organizations, thus achieving what is known as competitive advantage. Therefore, the advantage is not achieved for organizations without access to competitive capabilities, because the competitive advantage depends in essence on internal and external factors. The external factors are political, technological and cultural factors, while the internal factors are the organization's ability to possess resources and capabilities that are not available to its competitors (Metabis & Al-Hawary, 2013; Alshurideh et al., 2017; Alolayyan et al., 2018; Al-Hawary et al., 2020; Al-Quran et al., 2020; Mohammad et al., 2020; AlHamad et al., 2022). The importance of competitive capabilities lies in providing the opportunity for organizations to overcome the narrowness of the local market, as it helps to provide a competitive environment that ensures organizations efficiency in production. If the organization competitive ability is available, this will help the organization to reach an effective method and approach to ensure economic efficiency and promote economic growth in addition to developing creativity and innovation skills in the organization (Al-Hawary & Hadad, 2016; Alsharari & Alshurideh, 2020; AlShehhi et al., 2020; Alsuwaidi et al., 2020).

Cost leadership capabilities: Cost leadership capabilities require the organization to have the ability to offer products with low costs and an acceptable quality, by seeking to reduce costs in various ways, and that the organization pays high attention to cost control and employee performance monitoring to ensure optimal utilization of resources. As the industry becomes more mature and costs decrease, this will increase organization market share and thus increase sales amount, which means an increase in profits.

Flexibility capabilities: Flexibility is defined as the organizations ability to effect change from one product to another, from one market to another, or from one customer to another, at the lowest possible costs and time, in addition to quickly adapting to changes, disturbances and complexities in the markets and in production volume, where flexibility is one of the most prominent trends with critical importance of the organization's competitive and strategic capabilities, as it is considered a mainstay in the organizations success (Al-Hawary & Al-Menhaly, 2016; Al-Hawary & Al-Smeran, 2017; Al-Hawary & Hussien, 2017; Al-Hawary et al., 2017; Alolayyan et al., 2018).

Speed response capabilities: This priority refers to the organization's ability to provide products and services according to the schedule agreed upon between them and consumers, as many international companies such as FedEx have adopted this competitiveness as they considered it one of their most important competitive priorities within their framework.

2.3 Strategic Vigilance and Competitive Capabilities

A study conducted by Haroun and Hamo (2019) showed that there is a statistically significant relationship between strategic vigilance and competitive capabilities, and that the use of strategic vigilance functions enhances the organization competitive capabilities. Mesbah and Boukhamkham (2019) found that the organization relies in formulating its competitive strategies on the information that vigilance provides about competitors and everything that would affect its competitive position. Whereas, Sanaz and Yaghub (2019) study, which was conducted with the aim of identifying the factors affecting competitive advantages, showed that the organization needs to be strategically agile to reach competitiveness and achieve competitive advantages, this was agreed by the study (Arokodare et al., 2019), which found that strategic agility enhances the company performance, thus achieving competitive capabilities and access to global markets. From the foregoing, we conclude that strategic vigilance increases the organization competitiveness by providing information that contributes to making decisions related to improving competitive capabilities, which the researcher previously concluded is directly related to customers. And the researcher defined it as the organization ability to create and discover the aspirations, desires and needs of customers and analyze them in order to adapt their production capabilities to simulate and apply those aspirations in a proactive manner that guarantees the organization's singularity with this product or service. It works to ensure the organizations competitive advantages continuity and sustainability. The research hypothesis can be formulated as follows.

There is a statistically significant effect of strategic vigilance on competitive capabilities in Jordanian insurance companies.

3 Study Model

See Fig. 1.

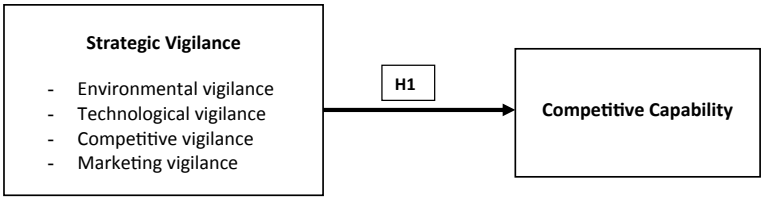

Fig. 1 Research model

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4 Methodology

4.1 Study Population

The study population, which is the Jordanian insurance companies, operates under the umbrella of the Jordanian Federation of Insurance Companies, a union that was established in (1989) and includes in its membership all the 24 Jordanian insurance companies (www.joif.org), where insurance companies work is based on several Pivotal aspects include life insurance, car insurance, fire insurance, and marine insurance. Since the union establishment, the insurance sector has witnessed a relative increase in the intensity of competition, especially in the past five years. The researcher found the need to study this sector, especially after the increase in employees' numbers in it in the past decade, where employees' numbers in insurance companies reached (2017)—the last approved statistic—(3124) employees, including employees of the union, in addition to employees of insurance companies (except for sales people) and the insurance administration. The study population consisted of workers in the upper and middle management of these companies, where the managers was (288) from various specializations.

4.2 Study Sample

The study relied on an equal stratified random sample consisting of (167) individuals from the upper and middle management level in the Jordanian insurance companies. The appropriate sample size is (167) individuals. The reason for choosing (167) individuals as a sample for the study is due to the fact that the study population consists of (288) individuals, and according to (Sekaran & Bougie, 2016, 295), the appropriate sample size is (167).

4.3 Study Tool

The study tool includes 32 item to measure the study variables, 20 items were to measure the independent variable, strategic vigilance with its dimensions (environmental vigilance, technological vigilance, competitive vigilance, marketing vigilance) based on the following previous studies: (Haroun & Hamo, 2019), (Zhou et al., 2019) as follows: Items (5-1) measure environmental vigilance, items (10-6) measure technological vigilance, items (15-11) measure competitive vigilance, and items (10-6) measure competitive vigilance. (16-16) marketing vigilance. (12) items were to measure the dependent variable (competitive capabilities) based on the

following previous studies. As follows: items (24-21) measure cost leadership capabilities, items (28-25) measure flexibility capabilities, and items (32-29) measure responsiveness capabilities.

4.4 Measurement Model Analysis

SmartPLS 3.2.9 software was used to test the model with latent variables and to perform measurement model tests. First, this study found no outliers that exceeded the permissible limit therefore the outliers number remain as it is, after that the measurement model was examined to examine the reliability and validity of the instruments (Hair et al., 2011; Al-Adamat et al., 2020; Al-Gasawneh & Al-Adamat, 2020). Sekaran and Bougie (2016) pronounced reliability as the way an instrument measures the concept it is meant to measure consistently, while validity was defined as the ability of the instrument to measure the concept it is intended to measure.

The PLS measurement model analysis comprised reliability and validity (internal consistency and convergent and discriminate validity). The measurement model measures are as follows: all the item loadings should be more than 0.7 or 0.6 (Hair et al., 2017; Tan et al., 2017). The composite reliability (CR) value ought to be 0.7 or greater; and the average variance extracted (AVE) should be at least 0.5 (Hair et al., 2010, 2017). Further. for validity testing, the convergent validity reflects whether a specific item estimates a latent variable that it is expected to measure (Tan et al., 2017; Urbach & Ahlemann, 2010), while the AVE assesses the measure of change that a build catches from its contrasting markers and the sum because of the estimation mistake (Fornell & Larcker, 1981; Ringle et al., 2015; Tan et al., 2017). Table 1 presents the latest reliable as well as valid measurement model conducted using Smart PLS version 3.2.9.

Table 1 shows the results of the reliability and validity assessments of the measurement model. As Table 1 which shows that all items were above 0.6. The results also depict that the CR of all constructs exceeded the threshold value of 0.7, ranging from 0.839 to 0.906. This illustrates that the measurement model of this study is reliable (Hair et al., 2017). Additionally, the validity was examined based on its convergent and discriminate validity for the measurement model. The convergent validity of the measures was accepted, with AVE values greater than the recommended level of 0.5, ranging from 0.592 to 0.763 (Hair et al., 2017).

Discriminate validity is confirmed when item loading should load more highly on own construct than on other constructs. Hence, researchers assessed discriminate validity by differentiating the square root of the AVE value of each construct with all the other constructs to be larger than the correlations between two factors (Barclay et al., 1995; Fornell & Larcker, 1981). Thus, Table 2 reveals that the correlation scores between each construct with itself is greater than all other constructs. This indicates that the discriminant validity was met by all constructs and it is acceptable. Therefore, it can be concluded that the measurement model is reliable and valid. Based on this, the data' reliability and validity of the instrument were confirmed.

Table 1 Results of reflective measurements model—a summary

Constructs	Indicators	Internal consistency reliability			
		Loading	(AVE)	Composite reliability	Crombach's alpha
		>0.60	>0.50	0.70–0.90	0.60–0.90
Strategic vigilance					
Environmental vigilance	Q1	0.700	0.67	0.92	0.90
	Q2	0.886			
	Q3	0.879			
	Q4	0.813			
	Q5	0.751			
Technological vigilance	Q6	0.731	0.64	0.92	0.85
	Q7	0.814			
	Q8	0.814			
	Q9	0.788			
	Q10	0.806			
Competitive vigilance	Q11	0.852	0.66	0.94	0.87
	Q12	0.822			
	Q13	0.799			
	Q14	0.787			
	Q15	0.789			
Marketing vigilance	Q16	0.808	0.60	0.93	0.89
	Q17	0.734			
	Q18	0.855			
	Q19	0.862			
	Q20	0.801			
Competitive capabilities					
	Q21	0.765	0.60	0.95	0.95
	Q22	0.736			
	Q23	0.755			
	Q24	0.773			
	Q25	0.769			
	Q26	0.809			
	Q27	0.763			
	Q28	0.808			
	Q29	0.757			
	Q30	0.743			
	Q31	0.773			
	Q32	0.853			

Table 2 Discriminate validity of constructs

Construct	EV	TV	CV	MV
Environmental vigilance	1.00			
Technological vigilance	0.656	1.00		
Competitive vigilance	0.511	0.618	1.00	
Marketing vigilance	0.420	0.583	0.589	1.00

4.5 Structural Model Analysis

The structural model consists of the constructs or latent variables and the paths that connect them with each other (Hair et al., 2017). Figure 2 is the schematic diagram of the structural model, which starts with EV, TV, CV, and MV. The arrows linking the constructs are determined by the direction of the five hypotheses proposed in the paper. The standardized estimate for the structural model of this study shows the direct relationship between Strategic Vigilance dimensions and Competitive Capability. To clarify more, the coefficient of path Values ranges from −1 to +1, which expresses the depth of the relationship between any two constructs (Hair et al., 2017).

Ramayah et al. (2016) specified the critical values for significance in 1-tailed tests as follows: $p < 10\%$ (1.64), $p < 5\%$ (1.96), and $p < 1$ (2.58); also, as usual, the researchers in marketing utilized the significance level of $p < 5\%$. Hair et al. (2017) stated that the bias-corrected bootstrap confidence intervals (lower limit, upper limit) allow testing whether a path coefficient is significantly different from zero. If the confidence interval for an estimated path coefficient does not include zero, this means there is a significant effect of this path (Hair et al., 2017). Therefore, the

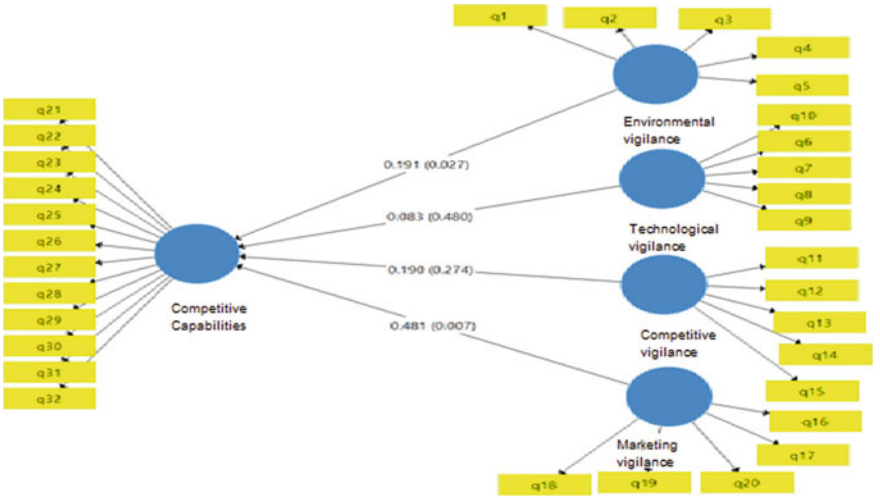

Fig. 2 Structural model results

Table 3 Summary of the structural model results

Hypothesis	Relationship (direct)	Direct effect (β)	t-statistic	p values	Decision
H1.1	Direct relationship EV → CC	0.191	2.211	0.027	Supported**
H1.2	Direct relationship TV → CC	0.083	0.708	0.480	Not supported
H1.3	Direct relationship MV → CC	0.190	1.095	0.274	Not supported
H1.4	Direct relationship CV → CC	0.481	2.710	0.007	Supported*
H1	Direct relationship SV → CC	0.836	23.087	0.000	Supported**

Note Significance level at ** $p < 0.01$, * $p < 0.05$ (one-tailed). LL, lower limit at 5%; UL, upper limit at 95% confidence interval; BC, bias corrected

researcher set 5000 subsamples with a replacement from the bootstrap cases equal to the original set of data which is 138 and the results of the structural model for this study are shown in Table 3.

As can be observed in Table 3, the path coefficients of EV were found to have a significant relationship with CC; the result indicated that ($\beta = 0.191$; t-statistic of 2.211), which supported H1.1. Otherwise, the path coefficients of TV were found to have insignificant relationship with CC; where the result indicated that ($\beta = 0.083$; t-statistic of 0.708), which that mean that H1.2 is not supported. Also, the path coefficients of MV were found to have insignificant relationship with CC; where the result indicated that ($\beta = 0.190$; t-statistic of 1.095), which means that H1.3 is not supported. As for the path coefficients of CV were found to have a significant relationship with CC; the result indicated that ($\beta = 0.481$; t-statistic of 2.710), which supported H1.4. Furthermore, the path coefficients of SV were found to have a significant relationship with CC; the result indicated that ($\beta = 0.836$; t-statistic of 23.087), Moreover (R^2) = (0.698 which supported H1.

5 Discussions

study results showed that the strategic vigilance system adoption helps to control all components of its environment through the four basic types of adoption of strategic vigilance: commercial vigilance, technological vigilance, competitive vigilance, and environmental vigilance, as the use of strategic vigilance functions enhances the organization competitiveness and allows it to reach high net sales levels and achieve significant income and profit margins. According to these results and studies, this is evidence of the insurance companies' awareness of the need to follow up and monitor all information within their work environment (insurance), and reinforces

the insurance companies' awareness that information represents a strong point for the company if it is strategically monitored to avoid its risks and exploit its opportunities. It also indicates that Jordanian insurance companies' ability to understand and apply strategic vigilance in the company contributes vitally to improving and enhancing competitive capabilities, and leads the company towards differentiation, which gives it an advantage over its competitors in the market.

6 Recommendations

In light of the study findings, the researcher reached a number of recommendations that can be taken by Jordanian insurance companies' managers and decision makers in order to advance their current situation. Researchers recommended the necessity of establishing units for strategic vigilance within insurance companies because of their significant role in raising competitive capabilities levels within these companies. The researcher also recommended the need to form special work teams equipped with the minimum capabilities to enhance interest in the monitoring and collecting information process.

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The Impact of Emotional Intelligence (EI) on Teamwork Performance in Information Technology Sector in Jordan

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Abstract The study aimed to investigate the impact of emotional intelligence on teamwork performance. The study population consisted of all employees working in the IT private sector in Jordan. From all IT companies working in this sector, four IT firms, at King Hussein Business Park, were selected with total number of (80) IT employees. A questionnaire was developed as the study instrument, which was composed of ten dimensions with (65) items. Multiple regression analysis was used for testing the study hypotheses. The study results found that emotional intelligence

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_58

has a significant impact on teamwork performance. Based on the study results, the researchers recommend managers and decision makers to build good relationships with each other to improve the communication of information and ideas among the team members, and to have enough ability to overwhelm disputes occurring during the practice of work activities, which will make the work be achieved in smoother and faster mode.

Keywords Emotional intelligence · Teamwork performance · Information technology sector · Jordan

1 Introduction

Information technology (IT) sector is one of the most advanced sectors in Jordanian economy, where its growth rates are the highest in Jordan at a rate of 50% per year. Its future development is considered as a gateway for modernizing economic and social life in the kingdom (Batool 2013). Previous research has proven that intellectual quotient (IQ) is not the main factor that can predict the success and brilliance of employees at work. Emotional intelligence (EI) is an important element to determine employee's skills and competencies in communication and information technology, where the person with high (EI) is more able to build relationships and manage conflicts with others, because of their elevated capacity to understand the needs of the others they engage with (Lopes et al., 2005). EI which is considered as a set of skills and competencies, mainly based on knowledge, understanding, management and leadership of personal feelings and emotions between the individual and others, as well as internally between the individual and himself (Marzuki et al., 2015; Alameeri et al., 2020; Odeh et al. 2021). Newman and Joseph (2010) stated that in an organization, emotion regulation relates to job performance. It is well known that the good use and management of emotions leads to a positive influence on motivation (which in turn affects productivity and performance).

Moreover, increased emotional intelligence leads to improved personal and professional human interactions, which leads to a higher level of job performance of the employees in return (Batool 2013; Alsharari & Alshurideh, 2020). Emotional intelligence is an important predictor of key organizational outcomes including job satisfaction (Daus & Ashkanasy 2005; Al-Dhuhouri et al. 2020). According to the theory of emotional intelligence, a person who can understand his feelings and emotions and has full awareness of them as well as his ability to control stress can certainly have better relationships with colleagues and supervisors, hence, better job performance (Kafetsios & Zampetakis 2008; Obeidat et al. 2019). In addition, most of the organizations seek for an employee, who has the ability to cope with change and respond. Accordingly, Moghadam, Tehrani, and Amin (2011) proved in their study that the employee who has high (EI) affects positively in coping with situations and doing tasks in effective ways, especially in teamwork.

Information technology (IT) employees were selected for this study for the importance of IT sector, which is a highly value-added sector contributing significantly to gross domestic product (GDP) in Jordan which makes IT sector an important study sector to enhance employee performance individually or in teamwork. In addition, IT employees' job requires consistent concentration when they are coding programs, coping with stress. Also, they need to recognize their own as well as others' emotions in view of the nature of their work that follows teamwork.

According to several studies (e.g: Stys & Brown 2004; Singh, 2006), EI integrative components, such as consistent interactions and communications, cooperation with others, adaptability to stresses and conflicts, and self-motivation are very critical factors that increase the levels of the individual's productivity leading to the organizational performance. Therefore, EI factors have been examined against teamwork performance. According to Extremera and Rey (2016), EI factors have a significant role in the employee's efficiency and performance. He added that self-motivation, as an EI variable, is the inner force that drives individuals to accomplish personal and organizational goals, but regarding to social skills (such as, communication and cooperation) by virtue of the nature of IT staff's job they need to communicate with their teams as well as customers who communicate either through email or face to face to solve their problems or to convey their ideas to them, so for these reasons this study finds it is very important to reveal the levels of common EI social skills that are represented in (Communication, Cooperation, Adaptability to situation, Stress and Conflict Management, and motivation) as indicated by EI models, such Goleman Model of IE (1998), Bar-on Model, Singh model (2006), at employees of Jordanian IT sector, and investigate their impact on their teamwork performance.

2 Theoretical Background and Hypotheses Development

2.1 Intelligence (EI)

For long time, Emotional intelligence (EI) concept has developed gradually according to its increasing importance at all scientific fields so that the term of (EI) has become an essential at the level of individuals, teams, and even organizations that aspire to improve and develop its performance. Emotional intelligence (EI) is a defined as a conceptualization that has been discussed progressively by the literature of social psychology. Recently, emotional intelligence has been given much importance in research especially in psychological research. The concept of emotional intelligence was early introduced by Salovey and Mayer (1990). Who defined emotional intelligence as the individual's capability to manage his own emotions and the emotions of other individuals, to distinguish among them and to utilize information for facilitating one's reasoning, activities, and thinking (Mayer & Salovey, 1997).

Furthermore, Emotional intelligence as specified by Singh is the personal ability to respond appropriately and successfully to a wide variety of emotional stimuli

that is drawn from within the person and his surrounding environment. Emotional intelligence is also defined as the consciousness in using feelings and emotions and employs them by standards and methods of personal knowledge to cope with current situations and problems (Stys & Brown 2004). What's more, emotional intelligence is described as the ability of an individual to adapt to, choose, and change a situation through an emotional process (Gignac, 2010).

Another definition of Emotional intelligence is that it composed of a set of significant parts of individual's internal and external dealings, mindset, personality, stress management abilities, temperament adjustment and all these have significant impact on the individual and teamwork Performance (Fallahzadeh, 2011; Alshurideh et al. 2019; Alzoubi et al., 2021). Lastly, Bradberry and Greaves (2009) defined emotional intelligence as the individual's capability, aptitude, recognition assignment, accurate assessment and control of his senses against other individuals and groups. Depending on all above definitions of Emotional intelligence, the researcher can define the concept as "Knowing the self's emotions and the emotions of others and employing this knowledge intelligently to choose the best method that ensures the successful management of different life situations".

Individuals who have higher emotional intelligence are more expected to regulate, understand, and control emotions excellently in themselves as well as in the other individuals (Wijekoon et al. 2017; AlShehhi et al. 2020). There is substantial evidence that emotional intelligence is a better predictor of success than intelligence quotient. On the basis of intelligence quotient, one may get into a field but the ultimate success in that field depends upon emotional intelligence (Johar et al., 2019).

People who have a high level of emotional intelligence know their own feelings and manage them well, beside they understand and treat others' feelings properly. Accordingly, they are distinguished in all areas of life, more satisfied with themselves, efficient in their lives, and able to control their mental structure pushing their production forward (Huang & Lee, 2019). On the other hand, people with low level of emotional intelligence do not have the ability that can enable them to cope with stressful events, and thus they are characterized by depression, frustration and low level of production (Allozi et al., 2022; Zirak & Ahmadian, 2015).

Emotional intelligence helps individuals resolve emotional problems in their daily life, enhance their perception of positive emotions, and reduce negative emotions, eventually bringing life satisfaction (Chew et al.2013; Agha et al., 2021). Generally, it is believed that individuals who perceive more positive and fewer negative emotions in their daily life have higher subjective well-being (Fallahzadeh, 2011; Nuseir et al. 2021). Overall, people with a high level of Emotional intelligence will still demonstrate better social adjustment ability and emotional regulation skills than will do those low in Emotional intelligence and their Emotional intelligence will have a positive connection with life satisfaction (Mayer et al. 2000). In addition, Ciarrochi et al. (2000) found that this positive effect continued to exist even after general intellectual and character factors were controlled.

2.2 Team's Job Performance

Job performance is one of the most important factors for the organizations 'success. Today, many organizations seek to improve their performance through several methods, such as: adopting the team's approach, engaging employees in decision-making and policy, and motivating employees financially and morally (Al-Hawary et al., 2013; Al-Nady et al., 2013; Metabis & Al-Hawary, 2013; Al-Hawary, 2015; Al-Nady et al., 2016; Al-Lozi et al., 2017; Al-Hawary & Alajmi, 2017; Al-Hawary & Al-Namlan, 2018; Al-Lozi et al. 2018; Mohammad et al., 2020; Allahow et al. 2018; Alhalalmeh et al., 2020; Al-Hawary et al., 2020; Al-Hawary & Al-Syasneh, 2020; AlTaweel & Al-Hawary, 2021). Job performance is a fundamental concept for all organizations, because it is a phenomenon that is described as comprehensive and fundamental to all fields of administrative knowledge, as well as the dimension of the organization's survival (Saeed & Shakeel, 2013; Amarneh et al. 2021; Shamout et al., 2022).

There are several definitions of job performance; Wahyudi (2013) defined Job performance as "the output of an employee doing business". According to Zhang et al. (2014), job performance is "The glossary of administrative science terms defined performance as: "achieving a set of duties and responsibilities based on the performance rate of the trained efficient worker". Taylor and Beh (2013) defined job performance as "the process of monitoring and analyzing the employees' work and behavior, judging the degree of their competence in the work they are currently doing, and judging the prospects of future progress in their work and the extent to which they can have more responsibilities".

According to Scott et al. (2015), job performance is closely related to the nature of the work done by the employee and his understanding of the operations he performs in various types until the job tasks are accomplished. Therefore, the performance is the outcome of human behavior in the framework of the techniques and procedures that guide the work towards achieving the desired goals (Al Kurdi et al., 2021; Scott et al., 2015).

According to Strom et al. (2014), there are two main factors making up the job performance of the working staff: Task Performance (Role Behavior) and Contextual Performance. Task Performance is traditionally defined as the ability of the employee to perform his or her duties and responsibilities according to the task description, whereas Contextual Performance is the individual effort that is indirectly related to the basic tasks and activities of the job but related to stimulating tasks and processes that constitute the organizational, social and psychological environment. In other words, while performing the functional task means fulfilling job requirements successfully, contextual performance is related to the quality of social relations with the different community members: young people, the elderly, and clients, a factor that is not always linked to the job (Strom et al., 2014).

Scott et al. (2015) divided contextual performance into two sub-dimensions: facilitation of personal relationships and job dedication. Facilitation of personal relationships consists of well-planned behaviors, tends to teamwork, and support of peer

performance, whereas job dedication consists of disciplined internal behaviors such as work-related initiative, overtime work, and following of workplace rules.

2.3 The Relationship Between EI and Team' Job Performance

The extensive body of research advocates that capabilities of emotional intelligence contribute to excellent performance (Brouzos et al., 2014; Parker et al., 2004). Emotional intelligence's abilities are considered four times more significant than intelligence quotient (IQ) in deciding professional success and prestige. Emotional intelligence is a substantial predictor of performance in different work fields. Emotional skills, abilities and knowledge contribute to the enhancement of teamwork learning, their professional development for the success of higher levels of accomplishment, career success, personal wellbeing, and leadership (Chew et al., 2013).

Bar-On indicates that emotionally intelligent individuals are committed, excited and eager in their life, therefore they are usually found at the highest level of performance in their work team. Goleman (1995) expresses that emotional intelligence represents 80% of all learning while cognitive capabilities represent about 20%. Although it is a strong claim, but yet it needs to be adequately investigated that to what degree emotional intelligence really correlates to work performance, at individuals and teams.

Mayer et al. (2000) proposed that emotional intelligence improves with the increasing of age. They also reported that as emotional intelligence expanded, work-based success also improved and likewise, capabilities of communicating inspirational thoughts were also stimulated. Alternatively, as emotional intelligence diminished, oppositional behavior increased. Excellent emotional intelligence aptitudes are related to outstanding ability and capability to deal with one's own feelings and the feelings of other individuals (Brouzos et al., 2014). Based on the above literature the hypotheses study can be formulated as:

There is a significant impact of emotional intelligence (EI) on Teamwork Performance (TWP)

3 The Study Model

Below is a model that illustrates both the independent and dependent variables examined in this research study. EI's variables and their items were adopted from Bar-On, Bradberry and Greaves (2009), Extremera and Rey (2016), where TWP's variables

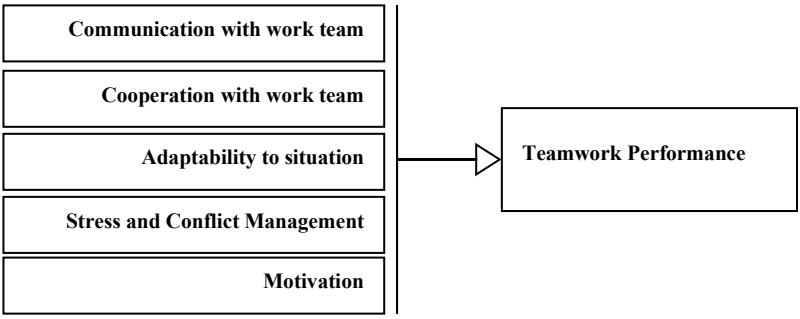

Fig. 1 Theoretical model

and their items were adopted from Froebel and Marchington, Finn et al., Higgs. All the variables' items were adapted to fit the study's environment (Fig. 1).

4 Methodology

4.1 Population and Sample of the Study

The study population consisted of all employees working in the IT private sector in Jordan. From all IT companies working in IT private sector in Jordan, four IT firms, at King Hussein Business Park (MICROSOFT, ORACLE, CISCO, IATA) were selected with a total number of (80) IT employees. Therefore, (80) questionnaires were provided to the respondents. After two weeks, (78) questionnaires were retrieved with percent of (97.5 %) of the total number of distributed questionnaires. Then, six questionnaires were excepted because they were improperly filled. Therefore, the final questionnaire's number was (72), with percent of (90%) of the total sample's number, which is very accepted for data analysis.

4.2 The Study Instrument

The questionnaire was developed as an instrument for this study, which was developed based on the literature relating to the current study topic and its concepts. **First section**: it includes the questions relating to the demographic data of the sample (Gender, Age, Scientific Qualification, and Experience). **Second section**: it includes the two main variables: **Emotional Intelligence (EI),** which was composed of (37) items measuring the following dimensions: Communication with the work team which was measured by (6) items, cooperation with the work team which was measured by (6) items, adaptability to situation which was measured by (7)

items, Stress and Conflict Management which was measured by (7) items, motivation which was measured by (11) items. **Teamwork Performance (TWP)** which was composed of (28) items measure the following dimensions: Cooperation and coordination which was measured by (6) items, effectiveness which was measured by (6) items, trust which was measured by (5) items, cohesion which was measured by (6) items, and job performance which was measured by (5) items.

4.3 Construct Validity

To test the construct validity of the study, pilot test was carried out, in which (30) questionnaires were provided to (30) IT employees who were from the main study sample, (27) Questionnaires were retrieved and were valid for testing the construct validity and reliability of the study instrument. Construct validity measures the extent to which the objectives of the instrument have been achieved, and whether the instrument is able to measure its content for which it was designed. Correlation coefficient (Pearson Correlation) was found to determine the degree of item's correlation with the total score of its dimension. Items with negative or less than 0.25 degree of correlation are considered low and preferably deleted. (Tables 1 and 2) show the results of the construct validity.

Table 1 shows that correlations' coefficients between each item of EI with its main dimension ranges between (0.465–0.869) exceeding the cut-off level (0.25), and they are significant at ($\alpha \leq 0.05$), which confirms that all EI scale items are valid to measure EI variable.

Table 2 shows that correlations' coefficients between each item of TWP with its main dimension range between (0.560–0.883) exceeding the cut-off level (0.25), and they are significant at ($\alpha \leq 0.01$), which confirms that all TWP scale items are valid to measure TWP variable.

4.4 Testing Reliability

The Reliability of the study instrument was measured by calculating the value of Cronbach's Alpha coefficient, where the result is statistically acceptable if the Cronbach's Alpha coefficient is greater than (0.60), and the more this value is close to 1 (i.e. 100 %), the more the reliability of the study instrument is acceptable.

Table 3 shows that Cronbach Alpha for EI's dimensions and TWP Dimensions ranged between (0.838–0.941) and the total Cronbach Alpha for EI value is (0.917), which confirms that EI and TWP scale can be described by reliability and all data collected for measuring EI and TWP are reliable to measure all dimensions of EI and TWP.

Table 1 Correlation coefficients between each EI's item and its dimension

EI dimensions									
Communication with work team		Cooperation with work team		Adaptability to situation		Stress and conflict management		Motivation	
Item num	Correlation	Item num	Correlation	Item num	Correlation	Item num	Correlation	Item num	Correlation
1	0.713**	1	0.692**	1	0.856**	1	0.761**	1	0.710**
2	0.814**	2	0.817**	2	0.663**	2	0.768**	2	0.626**
3	0.637**	3	0.803**	3	0.627**	3	0.680**	3	0.465*
4	0.485*	4	0.788**	4	**0.403**	4	**0.341**	4	0.792**
5	0.590**	5	0.623**	5	0.794**	5	0.810**	5	0.748**
6	0.757**	6	0.645**	6	0.869**	6	0.757**	6	0.867**
7	**0.434**			7	0.843**	7	0.710**	7	0.739**

** Correlation is significant at the 0.01 level (2-tailed)

* Correlation is significant at the 0.05 level (2-tailed)

Table 2 Correlation coefficients between each TWP's item and its dimension

(TWP) dimensions									
Cooperation and coordination		Effectiveness		Trust		Cohesion		Job performance	
Item	Pearson correlation	Item	Pearson correlation	Item	Pearson correlation	Item	Pearson correlation	Item	Pearson correlation
1	**0.326**	1	0.628**	1	0.866**	1	0.881**	1	0.842**
2	0.883**	2	0.740**	2	0.714**	2	0.801**	2	0.851**
3	0.560**	3	0.670**	3	0.759**	3	0.800**	3	0.840**
4	**0.115**	4	0.879**	4	0.648**	4	0.804**	4	0.830**
5	0.874**	5	0.800**	5	0.584**	5	0.650**	5	0.820**
6	0.727**	6	0.819**			6	0.787**		

** Correlation is significant at the 0.01 level (2-tailed)

* Correlation is significant at the 0.05 level (2-tailed)

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Table 3 Cronbach Alpha values for "EI" dimensions and TWP dimensions

Variables	(Cronbach Alpha)	Num. of items
Communication with work team	0.910	6
Cooperation with work team	0.909	6
Adaptability to situation	0.898	6
Stress and conflict management	0.917	6
motivation	0.902	7
Cooperation and coordination	0.862	4
Effectiveness	0.838	6
Trust	0.858	5
Cohesion	0.836	6
Job performance	0.941	5

4.5 Testing Normality (Kolmogorov–Smirnov & Shapiro Tests)

Kolmogorov-Smirnov test and Shapiro test were used for testing normality of data distribution, which is used in case the number of cases is ≥ 50. In these tests, data are described as normally distributed in case the significance is > (0.05).

Based on the tests' data shown in Table 4, the data of the two main variables (EI and TWP) was normally distributed, where the significance values for all dimensions were greater than 5%.

4.6 The Study Model Fit

According to the nature of data in this study, parametric methods are considered the most appropriate methods for measuring the impact of variables. Parametric methods include the diagnosis of "Multicollinearity" between independent variables and "Autocorrelation", where the ideal situation in multiple regression requires that the independent variables should be strongly associated with the dependent variable, at the same time should not be correlated with each other, where the strong correlation between the independent variables lead to a decrease in the value of (R), because the independent variables share the same variance of the dependent variable creating difficulty of determining the relative importance of each independent variable.

Table 4 Normal distribution test of data based on (K-S) values

EI variables	Mean	SD	Kolmogorov–Smirnov (Sig.)	Shapiro–Wilk (Sig.)
Communication with work team	4.0447	0.55113	0.200	0.327
Cooperation with work team	3.9127	0.61151	0.089	0.207
Adaptability to situation	3.9365	0.63108	0.096	0.263
Stress and Conflict Management	3.8095	0.65361	0.122	0.234
Motivation	3.9437	0.54884	0.113	0.166
TWP variables	*Mean*	*SD*	*Kolmogorov–***Smirnov** *(***Sig.***)*	*Shapiro–Wilk (Sig.)*
Cooperation and coordination	3.8571	0.57563	0.102	0.192
Effectiveness	3.9968	0.72318	0.123	0.077
Trust	3.9238	0.63396	0.132	0.200
Cohesion	3.9762	0.62425	0.235	0.317
Job performance	3.2762	0.7402	0.200	0.252

5 Testing Hypotheses

Two main tests were used for confirming that the study is devoid of multicollinearity; variance inflation factor (VIF) which should be ($\leq$10), and tolerance which should be ($\geq$1), and less 5 should VIF between $\geq$ 1 and $\leq$ 5. Table 5 shows that the values of VIF and Tolerance have met these two conditions, which indicates that there is not "Multicollinearity" between the independent variables, and thus they are suitable for multiple linear regression analysis relating to the main hypothesis.

Multiple regression analysis was employed to test the study hypotheses which states that: "There is a significant impact of emotional intelligence (EI) on Teamwork Performance (TWP)". In this model, emotional intelligence acts as the dependent variable and Teamwork Performance, as the independent variables. From the result as shown in Table 5, the regression model was statistically significant ($F = 357.106$; $R2 = 0.86$; $P = 0.000$). The adjR2 is 0.86, which means that 86% of the variation in Teamwork Performance can be explained by emotional intelligence. The proposed model was adequate as the F-statistic = 357.106 were significant at the 5% level ($p < 0.05$). This indicates that the overall model was reasonable fit and there was a statistically significant association between emotional intelligence and Teamwork Performance.

Table 5 also shows that Communication with work team (ß = 0.707, $p < 0.05$), Cooperation with work team (ß = 0.811; $p < 0.05$), Adaptability to situation (ß = 0.154, $p < 0.05$), Stress and conflict management (ß = 0.419; $p < 0.05$), and

Table 5 Regression summary of emotional intelligence and teamwork performance

Model	Standardized coefficients ß	T	SIG	Collinearity statistics	
				Tolerance	VIF
Communication with work team	0.707	3.500	0.002	0.459	2.180
Cooperation with work team	0.811	6.293	0.000	0.264	3.787
Adaptability to situation	0.154	2.336	0.034	0.287	3.481
Stress and conflict management	0.419	3.101	0.007	0.337	2.963
Motivation	0.703	3.116	0.003	0.367	2.728

Notes Adj. R 2 = 0.86; Sig. F = 0.000; F-value = 357.106; dependent variable, Teamwork Performance
$p < 0.05$

Motivation (ß = 0.703; $p < 0.05$) had a significant effect on Teamwork Performance. Cooperation with work team had the highest effect on Teamwork Performance. This provides evidence to support H1a, H1b, H1c, H1d, and H1e.

6 Discussion

The results showed that dimension of emotional intelligence (as a whole) has come within the high level, from the study sample individuals' perspective, where communication with work team obtained the highest degree, while stress and conflict management got the lowest degree. The follows explain detailed discussion of emotional intelligence and its dimensions.

The study results found that Communication with work team has been classified in the first rank, which means that the relationships among all teamwork members are based on respect and appreciation feelings even there is difference in opinions and ideas, which is regarded very important for teamwork performance. Also, the results confirmed that teamwork members are mostly having a dialogue mode when facing problems or variance in suggestions, which means that IT private sector companies reinforce their employees' interaction and integration by providing training and development programs that grows their personal and social skills.

The study results found that motivation was found at a high level with the fifth rank in IT industry in Jordan. This result proves that IT employees in Jordan are practicing their work with motivating emotions that support them to do work actively. This intrapersonal emotional motivation may be attributed to external motivation provided by the organization's management to increase their employees' job satisfaction, and thus increases their performance. This result indicates that IT employees may have

stability motives, which are (motivation and emotional stability), that are considered integrated properties drawn from intrapersonal emotional intelligence.

The study results found that Adaptability to Situation was found at a high level with the third rank in IT private sector in Jordan. This result explains that teamwork employees in IT sector in Jordan behave emotionally adapting their thinking according to the situation conditions. This means they have ability to be flexible to accept new changes in their companies. The results proved that employee of IT sector in Jordan has a high level of emotional intelligence by understanding emotions and feelings of his team members. By this respond to the external environment represented in other employees in the organization but outside the teamwork, and IT sector employee has typically the concept of emotional intelligence defined by Goleman (1995) that emotional intelligence is the individual's ability to understand his emotions, the emotions of others, their knowledge and directions, control and deal with them positively, motivate the self, manage emotions and relationships with others effectively.

The study results found that Cooperation with the Work Team was found at a high level with the second rank in IT private sector in Jordan. This explains that teamwork members have good understanding of the team goals and objectives, and thus try to work in a cooperative manner to achieve those objectives effectively. The results indicated the teamwork member has willingness to help each other by providing suitable information to his colleagues for purpose of helping them to accomplish their job's tasks. This cooperative behavior goes beyond this advantage when the teamwork member tries to facilitate the tasks required from the colleagues as initiative to work team even if the colleagues have not asked the help. But this advantage must be activated in case of absence of some members, which means that some job' s positions are related to specific employees but not integrated to others.

The study results found that Conflict and Stress Management was found at a high level with the fourth rank in IT private sector in Jordan. Teamwork has many stressful situations that need a person who deals with the stresses and conflicts flexibility and wisely by control of emotions. IT sector mostly depends on cooperation and interaction among team members, which entails stresses tolerance and flexible ability to manage teamwork-based conflicts. This result confirms that IT employees in Jordan have ability to manage stressful situations and deal with conflicts intelligently complying to the concept of Conflict management included in Goleman model (1995) and Singh model (2006) that expressed conflict management as The individual's ability to negotiate, resolve disputes, deal with difficult characters and long-term problems in a diplomatic and tactical method, in addition to the encouragement of open debate, as well as focus on latent and invisible conflict points.

The study results found that the Teamwork Performance has come in the high level at IT sector in Jordan. This refers to that IT private sector in Jordan depends on teamwork as a cooperative and collaborative work. Such this work enhances the investment of the organizational capabilities and core competences in a synergy mode. This high level of teamwork performance in IT sector is attained as outcome of multi-diversified skills' combination at the individuals of work team. This interpretation is supported by Frykman et al. (2014), where they asserted that any professional skills, such as

communicative skills, positive interaction, conflicts solving, have become very critical for an organization aspiring for competitive position. Such these highly required skills can be achieved just by teamwork, therefore managers and employers are looking for individuals who can practice their work in very collaborative environment (Frykman et al., 2014).

The study found that emotional intelligence at employees working in IT sectors has a significant impact on teamwork performance. This result explains that emotional intelligence at individuals belonging to teamwork supports and motivates the employees' ability and persistence to achieve their work activities effectively increasing their teamwork performance. This result supports Bar-On opinion who mentioned that emotionally intelligent individuals are committed, excited and eager in their life, therefore they are usually found at the highest level of performance in their work team. Also, the results support opinion of Goleman (1995), who expressed that emotional intelligence represents 80% of all learning while cognitive capabilities represent about 20%, which means that when IT teamwork's' employees are found intelligently emotional, they will be more eligible to learning. Moreover, this result can be interpreted by Chew et al. (2013), by conforming those Emotional skills, abilities and knowledge enhance effectively team work learning, their professional work achievement, career success, and leadership. Also, supported by Qualter et al. found that Emotional intelligence is a substantial predictor of performance in different work fields. The result is consistent with the study of Higgs, which confirmed that Emotional intelligence is strongly correlated to the performance of employees' staff. The result is consistent with the study of Law et al. (2007), which found that Emotional intelligence is a true predictive tool about job performance, and it comes consistently with the study of Lee et al. (2018), which showed Positive correlation between emotional intelligence and teamwork skills post-workshop. Also, the result comes consistently with the study of Johar et al. (2019), which found emotional intelligence with its dimensions (emotional awareness, emotional management, and social emotional awareness) positively correlated with academic performance.

7 Recommendations

According to the results of the study, the researcher recommends managers and decision makers to build good relationships among employees to facilitate the communication of information and ideas among the team members. This flexible information communication between the team members should motivate the innovative and creative thinking at the IT employees effectively. Teamwork members should activate the process of knowledge sharing and application. Knowledge sharing among the team members will make the new concept easily shared and valuable at all the employees, and according to which they can develop their work performance. IT employees should have enough ability to overwhelm disputes occurring during the practice of work activities, which will make the work be achieved in smoother and faster mode. This positive behavior of IT employee may be supported and be more

enhanced when IT employee has an initiative to give the most priority to the work duties more than personal stubbornness. IT employees should try to get an opportunity that may lead to their work improvement and their skills development, whether inside or outside the organization. Therefore, they should try to be included in training programs that may develop their options' capabilities and improve their functional skills so that they can be able to adapt to new business processes and new IT development. Finally, Leaders of companies in Jordanian IT should build proper mechanism that can enable the teamwork members to work in an integrative manner. Which mean that an employee must be distributed in his team position based on his skills and capabilities. Such this mechanism of employees' distribution should lead the teamwork employees to practice their work activities interactively and consistently overcoming some functional gaps penetrating teamwork performance.

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The Impact of Functional Withdrawal on Organizational Commitment as Perceived by Nurses Working in Public Hospitals in Jordan

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Abstract The major aim of the study was to examine the impact of functional withdrawal on organizational commitment. Therefore, it focused on Jordanian public hospitals operating in the north region. Data were primarily gathered through self-reported questionnaires created by Google Forms which were distributed to a random

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_59

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sample of (306) nurses via email. Structural equation modeling (SEM) was conducted to test hypotheses. The results demonstrated in Table 2 show that functional withdrawal has a negative impact on organizational commitment. In light of the findings of the study, managers and decision makers in hospital management should provide support, material and moral incentives, and educational, development and promotion opportunities for employees, especially nurses, with the need to focus on knowing the needs of nurses to increase their connection with their organization and reduce their tendency to search for new opportunities and leave work.

Keywords Functional withdrawal · Organizational commitment public hospitals · Jordan

1 Introduction

Organizations seek to find and provide an appropriate environmental and practical environment in which the employee feels his importance and his role in achieving the organization's goals (Al-Hawary & Al-Hamwan, 2017; AlTaweel & Al-Hawary, 2021). Despite the efforts made by these organizations to satisfy the workers and improve their performance (Al-Nady et al., 2013; Allahow et al., 2018; Al-Hawary & Al-Syasneh, 2020; Mohammad et al., 2020), the workers must be exposed to pressures and circumstances that push them to carry out practices and behaviors that have a negative impact on the individual and the organization, which may make the individual fall under the practice and behavior of the so-called career withdrawal, which is one of the most behaviors (Sweissi & Mahjar, 2017). Job withdrawal is one of the most important administrative problems faced by organizations, which troubles working managers and researchers in organizational affairs because of its negative effects and the material and moral loss it causes to the organization and to individuals, especially if the organization spends a lot of its financial resources on training and developing the employee to become an expert and efficient (Al-Hawary, 2009; Al-Hawary & Nusair, 2017; Al-Hawary et al., 2012; Sweissi & Mahjar, 2017).

Job withdrawal occurs when the employee is not satisfied with his work, which negatively affects job performance and production, as well as commitment to the job and the organization (Al Kurdi et al., 2021; Allozi et al., 2022). As for psychological withdrawal, it is a set of actions and behaviors that an individual performs to escape and stay away from performing the tasks and duties assigned to him, where the individual is physically present and mentally and psychologically absent from work, among these practices include daydreaming, building informal social relationships, pretending to be busy, surfing the Internet and doing other work during the official working hours that have nothing to do with the job duties he performs (Sweissi & Mahjar, 2017). Job withdrawal, both physical and psychological, plays an important role in the decrease in organizational loyalty, which increases the losses of organizations and job instability, which in turn will negatively affect the level of overall performance (Al Kurdi et al., 2020a, b; Alameeri et al., 2020).

The health sector is one of the important sectors in which the medical staff has a decisive role in providing treatment services to patients in an efficient and effective manner (Aburayya et al., 2020a, b). However, the presence of job withdrawal behaviors, especially for nurses, will increase the degree of their instability and loyalty to the hospital in which they work, and thus lower the level of health services provided to citizens. It was noticed that the percentage of employees late to come to work on time and the increase in spending of official working hours outside the departments in which they work through social conversations, in addition to the observation of nurses' preoccupation with using modern means of communication, smart phones and social media in abundance during working hours with no attention to achievement and complete the tasks required (Aburayya et al., 2020c, d; Alshurideh, 2014).

The mentioned practices fall under the organizational term, which is job withdrawal, as it is considered one of the negative and unhealthy phenomena in organizations because of its undesirable effects at the individual, group and organizational levels (AlShehhi et al., 2020; Hayajneh et al., 2021). Withdrawal is a way for an individual to escape from the reality of work, whose negative effects are reflected on the organization, which requires striving and working hard to avoid them by controlling these behaviors and standing at the level of their practice and finding appropriate solutions to them (Alsuwaidi et al., 2020; Al-bawaia et al., 2022). The interest of researchers and business organizations has increased recently in issues related to organizational loyalty, as it is one of the most important goals that organizations seek to gain from their employees to increase the strength of the employee's attachment and his love to work because of its impact on job performance. Therefore, this study seeks to find out the effect of practicing job withdrawal behaviors on the organizational commitment of workers in the Jordanian health sector (Alshurideh, 2019, 2022; Alshurideh et al., 2020; Alzoubi et al., 2022).

2 Theoretical Framework and Hypotheses Development

2.1 Functional Withdrawals

Functional withdrawal is defined as a set of behaviors and practices carried out by an individual that express separation from his organization and his unwillingness to work in it (Redmond, 2010). Functional withdrawal is also defined as the employee's interruption or cessation of work in his organization with his desire, choice, and transfer to work in another organization (Al-Ghanim, 2003). Kaplan et al. (2009) defines functional withdrawal as a set of behaviors and practices that the employee performs when he decides not to stay in his work for reasons beyond his control so that he is less accomplished, performing and participating in work. There are two types of functional withdrawal, namely physical withdrawal and psychological withdrawal, and that both types It is not separated from the other and that they lead

to the result of each other, but this does not mean that the employee practices all behaviors at the same time. The functional withdrawal includes two types.

Psychological Withdrawal: Psychological withdrawal behaviors represent the individual's presence physically, but his absence mentally and psychologically (Sweissi & Mahjar, 2017). Lim et al. (2002) defined psychological withdrawal as a set of behaviors that the employee performs, which is represented by his physical presence and his mental absence from his work environment, which is represented by several behaviors, namely daydreaming, electronic surfing, pretending to be busy, doing side jobs, and building informal social relationships. From an organizational point of view, daydreaming is defined as showing the employee his preoccupation with his work and camouflaging, but he is originally busy and thinking about other things that are not related to work, and it is a way to relieve work pressure and escape from reality without seeking to solve the problem, so that these dreams become a means of escaping and withdrawing from the organization (Sweissi & Mahjar, 2017). Building informal social relations is clearly a bad withdrawal behavior that negatively affects the functioning and safety of work on the one hand, and it has a positive impact by increasing cooperation and love of teamwork and cooperation between individuals at work. It is considered entertainment for the employee that distances him from the work atmosphere. As for doing side jobs (**Moon Lighting**), it is the individual's exploitation of work time and resources to complete other tasks outside the scope of work or for the benefit of a job (Lim et al., 2002).

In this case, the individual is physically present at his place of work, but all his energy and effort are concentrated in another personal work that is not related to his current work. **Looking busy**: It is for the employee to appear intentionally that he is busy with something even though he is not doing any task, and the reason for this may be in order to avoid his manager assigning him other tasks. By pretending to organize papers and files or sitting at a computer pretending to complete a work-related task when in reality there is no work to be done (Hanish & Hulin, 1990). As for **Cyber loafing** is the use of the Internet and social media during official working hours for personal purposes and not for work purposes, and this behavior is considered a way to combat negative working conditions (Chen & Lim, 2012).

Physical withdrawal, which is defined as a set of behaviors and actions that the individual practices to avoid performing the tasks and duties entrusted to him, and the behaviors of physical withdrawal are represented in several practices, including **(Tardiness)**: It is the person's arrival late to work or leaving early before the end of the work. **Long breaks**: There are several reasons that drive the employee, the most important of which is the feeling of dissatisfaction with work, the lack of incentive to encourage working hard and boredom from the work routine. **Missing Meetings**, it is the employee's ignoring important meetings and work meetings that are part of his job. **Absenteeism**: It is the employee's failure to attend work, either with an excuse, because of illness or an emergency, or it may be without justification and is represented by the employee's absence for one or more days from work (Harrison & Price, 2003). And the last one is to leave work with the individual's desire or to resign (**Quitting**) due to circumstances related to the work itself or the employee, and it is the last solution for the employee and the highest degree of physical withdrawal.

2.2 Organizational Commitment

The concept of organizational commitment is one of the prevailing organizational concepts and one of the goals that all organizations strive to achieve (Alhalalmeh et al., 2020; Al-Hawary, 2013; Al-Hawary & Alajmi, 2017; Al-Hawary & Al-Smeran, 2017; Al-Hawary & Obiadat, 2021; Al-Hawary et al., 2020). Commitment, in the linguistic and idiomatic sense, expresses sincerity and fulfillment of the covenant, and it is an individual's feeling of love and devotion to something, his attachment, and his feeling of responsibility towards this thing (Al-Hawary et al., 2013; Al-Hawary & Abu-Laimon, 2013; Metabis & Al-Hawary, 2013; Al-Hawary, 2015; Al-Lozi et al., 2017; Al-Hawary & Al-Namlan, 2018; Al-Lozi et al., 2018; Al-Quran et al., 2020). Steers and Mowady (1974) defined commitment as: the strength of belonging and integration of the individual within the organization in which he works and his effective contribution to it, with a strong desire to continue working and belief in the organization's goals. It is the extent of the strong connection and integration between the individual and the organization, which leads him to accept the goals and values of the organization and work hard to achieve what the organization desires to achieve, and the desire to continue working in it and remain as a member (Al-Hawary, 2011; Al-Hawary & Aldaihani, 2016; Al-Hawary & Hadad, 2016; Al-Nady et al., 2016).

Judeh (2004) defined commitment as: a state of connection between an individual and his organization represented by his belief in the goals and values of this organization and through which he expresses his desire to work in it. Al-Fahdawi (2004) defined it as the level of the employee's positive feeling about his organization and commitment to its values and objectives, and the constant feeling of connection, pride in it, and his love for working, regardless of the financial return that he will derive from the work. Also, Al-Rawashdah (2007) defined organizational commitment as the unwillingness of the individual to leave his work in the organization in which he works for any reason, whether financial or other reasons, and his feeling that he is an integral part of the organization and his attachment to it and its values while striving to achieve its goals.

The dimensions of organizational commitment differ according to the entrance and axis through which it is studied, as the dimensions of organizational commitment varied. Organizational commitment consists of several components linked to each other and not separate, as these dimensions were classified in several models, including the model (Allen & Meyer, 1996), which is the model adopted by the study, where it classified the dimensions of organizational commitment as follows; **Affective Commitment**: It is the individual's feeling of pride in belonging to the organization in which he works and adopting its activities in a positive way, in addition to his feeling that he is part of the organization and that its problems belong to him, as the individual feels that he has strong relationships and friendships that work to keep him in the organization with a brotherly atmosphere that attracts and attracts him To continue working in it (Awaida, 2008). **Normative Commitment**: It expresses the individual's sense of obligation to remain in the organization and not to think about leaving it, and the feeling of guilt when leaving it because of a moral

and ethical commitment that works to keep him in the organization. **Continuance Commitment**: It is the individual's assessment of the benefits that he will derive and the losses that will result from staying with the organization or leaving it. This evaluation is affected by several factors, including the abundance or lack of available alternatives and jobs, the number of years of work in the organization itself, and the difference in systems between organizations (Alshraideh et al., 2017; Al-Khayyal et al., 2020; Alketbi et al., 2020).

2.3 Functional Withdrawal and Organizational Commitment

Making the organization the perfect place for the employee, motivating him, strengthening relations between the members of the organization, and improving working conditions, which leads in one way or another to a feeling of commitment to the organizations. Many studies have shown that these practices differ from one person to another depending on personal factors and characteristics such as gender, age and other characteristics that enable a person to deal with the circumstances surrounding him (Turan, 2015). Studies have shown that the practice of these behaviors is associated with several organizational factors such as the level of job satisfaction and job and organizational commitment (Bennett & Naumann, 2004). The employee's withdrawal practices reduce the effort he exerts at work, while not paying attention to the interest of the organization, and his interest is in preserving the material benefit that he achieves from staying at work in it (Harrison et al., 2006).

Several studies have mentioned functional withdrawal behaviors within the list of behaviors that the employee commits by stealing and exploiting work time by practicing behaviors that do not serve the interest and workflow, but rather negatively reflect on the performance of the organization and achieve the individual interest of the person who practices these behaviors (Brock et al., 2013). The employee's practice of functional withdrawal behavior is also considered as a disregard for the work and its requirements in a negative way that is reflected on the quality of the services provided. The researcher believes that being late for work becomes a withdrawal behavior if it occurs frequently and almost daily and in all periods of work and without justification or an official excuse, as the employee does not feel guilty because of his practice of this behavior. Based on the foregoing theoretical literature, the study hypothesis can be formulated as follows.

There is a significant effect of functional withdrawal on organizational commitment.

3 Study Model

See Fig. 1.

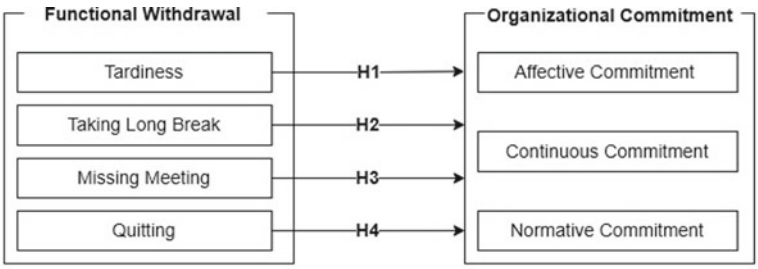

Fig. 1 Research model

4 Methodology

4.1 Population and Sample Selection

A qualitative method based on a questionnaire was used in this study for data collection and sample selection. The major aim of the study was to examine the impact of functional withdrawal on organizational commitment. Therefore, it focused on Jordanian public hospitals operating in the north region. Data were primarily gathered through self-reported questionnaires created by Google Forms which were distributed to a random sample of (306) nurses via email. In total, (285) responses were received including (18) invalid to statistical analysis due to uncompleted or inaccurate. Hence, the final sample contained (267) responses suitable to analysis requirements that were formed a response rate of (87.25%), where it proved to be sufficient to the extent that was predictable and allowed for a presumption of data saturation (Sekaran & Bougie, 2016).

4.2 Measurement Instrument

A self-reported questionnaire that consists of two main sections along with a section regarding control variables was used as the measurement instrument. Control variables considered as categorical measures were composed of gender, age group, educational level, and experience. The two main sections were dealt with a five-point Likert scale (from 1 = strongly disagree to 5 = strongly agree). The first section contained (17) items to measure functional withdrawal based on (Chen & Lim, 2012). These questions were distributed into dimensions as follows: four items dedicated for measuring tardiness, four items dedicated for measuring taking long break, four items dedicated for measuring missing meeting, and five items dedicated for measuring quitting. Whereas the second section included (15) items developed to measure organizational commitment according to what was pointed by (Allen & Meyer, 1996). This variable was a second-order construct divided into three first-order constructs.

Affective commitment measured by five items, continuous commitment measured through five items, and normative commitment measured using five items.

5 Findings

5.1 Measurement Model Evaluation

This study was conducted structural equation modeling (SEM) to test hypotheses, which represents a contemporary statistical technique for testing and estimating the relationship between factors and variables (Al-Adamat et al., 2020; Al-Gasawneh & Al-Adamat, 2020; Wang & Rhemtulla, 2021). Accordingly, the reliability and validity of the constructs were tested using confirmatory factor analysis (CFA) through the statistical program AMOSv24. Table 1 summarizes the results of convergent and discriminant validity, as well the indicators of reliability.

Table 1 shows that the standard loading values for the individual items were within the domain (0.543–0.913), these values greater than the minimum retention of the elements based on their standard loads (Al-Lozi et al., 2018; Sung et al., 2019). Average variance extracted (AVE) is a summary indicator of the convergent validity of constructs that must be above 0.50 (Howard, 2018). The results indicate that the AVE values were greater than 0.50 for all constructs, thus the used measurement model has an appropriate convergent validity. Rimkeviciene et al. (2017) suggested the comparison approach as a way to deal with discriminant validity assessment in covariance-based SEM. This approach is based on comparing the values of maximum shared variance (MSV) with the values of AVE, as well as comparing the values of square root of AVE ($\sqrt{}$AVE) with the correlation between the rest of the structures. The results show that the values of MSV were smaller than the values of AVE, and that the values of $\sqrt{}$AVE were higher than the correlation values among the rest of the constructs. Therefore, the measurement model used is characterized by discriminative validity. The internal consistency measured through Cronbach's Alpha coefficient (α) and compound reliability by McDonald's Omega coefficient (ω) was conducted as indicators to evaluate measurement model. The results listed in Table 1 demonstrated that both values of Cronbach's Alpha coefficient and McDonald's Omega coefficient were greater than 0.70, which is the lowest limit for judging on measurement reliability (De Leeuw et al., 2019).

5.2 Structural Model

The structural model illustrated no multicollinearity issue among predictor constructs because variance inflation factor (VIF) values are below the threshold of 5, as shown

Table 1 Results of validity and reliability tests

Constructs	1	2	3	4	5	6	7
1. Tardiness	**0.762**						
2. Taking long break	0.301	**0.741**					
3. Missing meeting	0.394	0.341	**0.744**				
4. Quitting	0.461	0.332	0.406	**0.764**			
5. Affective commitment	0.553	0.503	0.624	0.637	**0.740**		
6. Continuous commitment	0.512	0.645	0.534	0.622	0.524	**0.756**	
7. Normative commitment	0.603	0.614	0.550	0.574	0.584	0.647	**0.775**
VIF	2.514	2.066	1.581	2.368	–	–	–
Loadings range	0.703–0.814	0.645–0.834	0.543–0.864	0.675–0.913	0.675–0.824	0.670–0.826	0.707–0.865
AVE	0.580	0.549	0.553	0.583	0.547	0.571	0.600
MSV	0.418	0.461	0.501	0.466	0.513	0.409	0.511
Internal consistency	0.845	0.826	0.827	0.872	0.857	0.866	0.880
Composite reliability	0.846	0.828	0.829	0.874	0.858	0.869	0.882

Note Bold fonts refers to average variance extracted

Table 2 Hypothesis testing

Hypothesis	Relation	Standard beta	*t* value	*p* value
H1	Tardiness → organizational commitment	−0.557**	−14.164	0.002
H2	Taking long break → organizational commitment	−0.486*	−11.754	0.03
H3	Missing meeting → organizational commitment	−0.602***	−16.297	0.000
H4	Quitting → organizational commitment	−0.521**	−13.065	0.008

Note * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

in Table 1 (Hair et al., 2017). This result is supported by the values of model fit indices shown in Fig. 1.

The results in Fig. 2 indicated that the chi-square to degrees of freedom (CMIN/DF) was 2.715, which is less than 3 the upper limit of this indicator. The values of the goodness of fit index (GFI), the comparative fit index (CFI), and the Tucker–Lewis index (TLI) were upper than the minimum accepted threshold of 0.90. Moreover, the result of root mean square error of approximation (RMSEA) indicated to value 0.051, this value is a reasonable error of approximation because it is less than the higher limit of 0.08. Consequently, the structural model used in this study was recognized as a fit model for predicting the organizational commitment and generalization of its result (Ahmad et al., 2016; Shi et al., 2019). To verify the results of testing the study hypotheses, structural equation modeling (SEM) was used, the results of which are listed in Table 2.

The results demonstrated in Table 2 show that functional withdrawal has a negative impact on organizational commitment. Moreover, the results indicated that the highest impact was for missing meeting ($\beta = -0.602$, $t = -16.297$, $p = 0.000$), followed by tardiness ($\beta = -0.557$, $t = -14.164$, $p = 0.002$), then quitting ($\beta = -0.521$, $t = -13.065$, $p = 0.008$), and finally the lowest impact was for taking long break ($\beta = -0.486$, $t = -11.754$, $p = 0.03$).

6 Discussion

The results of the study revealed that there is insignificant effect of physical withdrawal on organizational commitment, which may be due to the employee's exposure to personal and social conditions that push him to practice these behaviors in a certain period of his work and does not mean his lack of love for work and the organization. The study results inconsistent with (Dahlke, 1996). It was also found that there was insignificant effect of physical withdrawal on emotional commitment. The employee's practice of one of the physical withdrawal behaviors does not mean the employee's lack of emotional commitment with his organization and place of work,

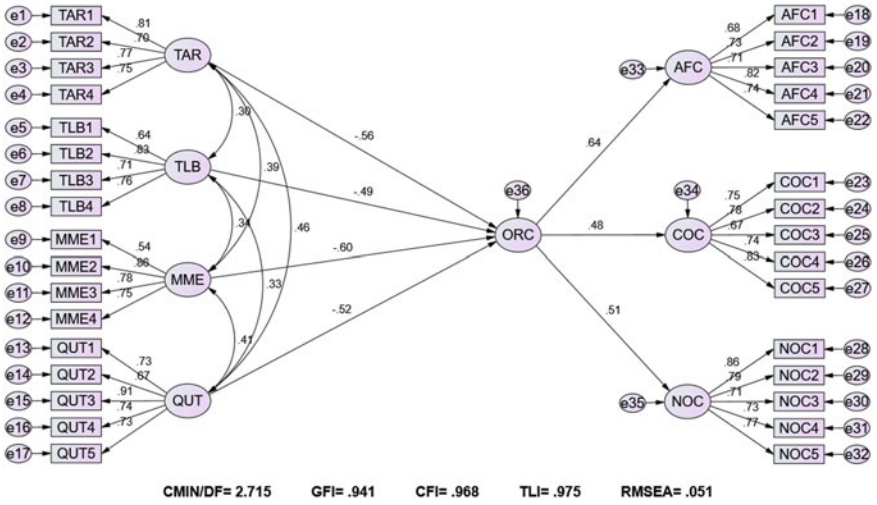

Fig. 2 SEM results of the functional withdrawal effect on organizational commitment

or his unhappiness with working in it, but the employee may be exposed to circumstances that push him to practice such behaviors such as the transportation crisis and family emergency circumstances, or obtaining work in a place close to his residence, which leads him to leave this Place and resignation and be more stable. The result of this study inconsistent with Somer (2009), Taris et al. (2004), and Somers and Binbaum (2000), which showed a negative relationship between physical withdrawal and organizational loyalty.

The study also found that there was insignificant effect of the remaining dimensions of physical withdrawal on continuous organizational commitment. The researchers attribute this result to the fact that the employee often seeks the best opportunities with the best financial return and the nature of the work that is more comfortable and closest to his place of residence and with better job privileges. He linked in his previous work is the payoff and the lack of better opportunities. It was also found that there is a negative, statistically significant effect of leaving work on organizational commitment, with no statistical significance for the remaining dimensions of physical withdrawal on organizational loyalty. In its conclusion, the study results agreed with Somers and Binbaum (2000) and Falkenburg and Schyns (2007).

7 Recommendations

In light of the findings of the study, managers and decision makers in hospital management should provide support, material and moral incentives, and educational, development and promotion opportunities for employees, especially nurses, with the need

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to focus on knowing the needs of nurses to increase their connection with their organization and reduce their tendency to search for new opportunities and leave work, and imposing deterrent penalties for those who are found to have exploited work hours to complete their personal matters during official working hours. Involve nurses in setting policies and making decisions that organize their work. Taking care of newly appointed individuals and recent graduates by holding meetings with them and informing them of the organization's vision, goals, values and policies to increase their awareness and enhance their loyalty to the organization.

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The Impact of Human Resources Agility on Job Performance in—Islamic Banks Operating in Jordan

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Abstract The study aimed to identify the impact of human resource agility on job performance in Islamic banks operating in Jordan. The study population consists of all managers in the upper management, middle management, and lower management in these banks. The study adopted the stratified random sample that is suitable for the managers in the upper, middle management and the lower management, who

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_60

are (148) respondents. To achieve the goals of the study and test its hypotheses, the researcher used the descriptive analytical approach, and collected data with a questionnaire used by the researcher as a main performance of collecting information. Smart PLS program was used to test study hypotheses. The study results showed a statistically significant effect of human resource agility on job performance in Islamic banks operating in Jordan. Based on the results of the study, the study recommends assisting decision makers in solving problems, among which was to enhance interest in practicing adaptive capacity, creativity in problem solving, professional flexibility, and learning skills.

Keywords Human resource agility · Job performance · Islamic banks · Jordan

1 Introduction

In the past, organizations dealt negative with individuals and did not provide them with the appropriate work environment, they considered individual like a machine and does not have any moral interests, and the organizations were only thinking of achieving their goal without looking at individuals' needs and desires. The organizations later began to recognize their employees' rights with the increasing control of the external environment factors, which eventually made them recognize the human element value and consider it the most important component, and one of the most important basic resources, in addition the added value that it can be added by individuals. Job performance concept appeared in the managerial literature as part of organizations overall performance, then the researchers' interest increased in line with their interest in the organization's overall performance, rather more researchers try to explore variables that affect job performance to improve and take their advantage (Al Kurdi et al., 2021; Allozi et al., 2022; Dhani & Sharma, 2017; Hayajneh et al., 2021; Kashyap, 2014).

Human resources agility is one of the most important topics that researchers and managers have paid great attention to, in response to the intense competition between business organizations in the markets, and the technological development (Al-Hawary, 2011, 2015; AlTaweel & Al-Hawary, 2021; Shakhour et al., 2021). Organizations has also contributed to the pursuit of using different methods from competitors that put them first in the local and global markets, and this will be not achieved without workers partnership.

Jordan banking sector contributes to economic development by providing job opportunities and services that promote well-being and increase people purchasing power, which calls for an attempt to advance this vital sector and to improve all the variables related to it for survival, growth and continuity. This puts on the shoulders of every bank to try to find a special advantage that makes it ahead of competition and owning a larger market share compared to other banks, and since the number of Islamic banks in the world is increasing, each bank has to provide its own services through which it can gain a larger number of customers (Al Kurdi et al., 2020a, b).

It is worth noting that this can be achieved by investing in human resources and raising their performance levels, as attention to the human resource agility results in distinctive, efficient and effective performance (the ability to adapt, creativity in solving problems, professional flexibility, learning work skills, bearing work pressures), therefore, each organization must provide an appropriate work environment for employees and pay attention to raising their skills and training them in a way that positively affects employees performance (performance of the context, performance of tasks).

The concept of human resource agility is attractive to researchers and scholars because it is one of the new topics that Arab literature lacks in, especially in its analytical form through studying the impact of human resource agility on job performance. Islamic banks operating in Jordan, like other business organizations, are exposed to high competition between them, and thus they must preserve their human resources and seek to improve the level of their work skills by using human resources agility that support job performance, as human resources agility must have a positive impact on employees job performance and those who contribute to raising the organizational performance levels, which may necessarily lead to organizational goals achievement and continuity (Alkalha et al., 2012; Al-bawaia et al., 2022).

2 Literature Review and Hypotheses Development

2.1 Human Resources Agility

Organizations operate in a fast-moving environment that requires rethinking of the human resources through planned education, helping to develop key competencies that enable individuals to maintain focus, and perform well in current and future jobs (Al-Quran et al., 2020; Al-Hawary & Abu-Laimon, 2013; Al-Hawary & Al-Namlan, 2018). Developing key competencies in an employee is essential to improving their performance and to empower them with capabilities in an agile context to improve performance (Al-Hawary et al., 2013; Al-Lozi et al., 2017, 2018).Since changing organizations have become more the rule than the exception, the human element agility has become as well (Jager et al., 2019), the effective use of human resource agility is often a critical factor in organizations in the long term to succeed over competitors, so organizations depend on agile human resources highly. Human resources, in their general sense, are known as job performance capabilities to enhance organizational competitive opportunities to survive in the business world, turning them into opportunities that can be exploited (Altamony et al., 2012; Alavi, 2016; Al-Hawary & Alajmi, 2017; Shamout et al., 2022). Agile organizations are able to meet the customers' needs and develop new, high-quality products with high competitiveness. Human element is an important element to develop his knowledge, ideas, judgment and cooperation quickly in line with the new working conditions called (human resource agility) or (individual agility) (Alhalalmeh et al, 2020;

Alshurideh et al., 2022). The aspect of HR agility is very important and has practical implications for the direct methods used in intervening for the technological, cultural and control changes needed for the organization (Khambayat & Affiliations, 2019). We can define HR agility as the human resources ability to respond quickly to market changes and flexibly deal with the unexpected to survive in the business environment. Human resources must be flexible and trainable to adapt quickly and easily to market conditions, also known as enhancing capabilities to survive in a globally volatile work environment (Muduli, 2013).

In the past decade, human resource agility training has been utilized in manufacturing and service operations. (Iravani & Krishnamurthy, 2006). Human resource agility has many dimensions, and the majority of researchers used the same human resource agility dimensions, which are (the ability to adapt, creativity in problem solving, professional flexibility, work stress tolerance, learning work skills) (Mubarak, 2012; Al-kasasbeh et al., 2016; AlHamad et al., 2022). Some researchers have used human resource agility dimensions as follows (flexibility, adaptation, motivation, training, participation, and empowerment) (Al-Hawary & Al-Syasneh, 2020). Other researchers dealt with the dimensions of workforce agility as (flexibility, creativity, quality) (Mubarak, 2012).

It is noted that there are similar and close dimensions when researchers study the subject of human resource agility, but a few have adopted the dimensions (proactive, adaptive, and flexible) (Al-Hawary et al., 2020). For achieving the study objectives, the dimensions were adopted as follows, **adaptability:** the employee's ability to change and adjust himself and his behavior better in the organization, adapting between people and cultures, learning new skills and responsibilities (Alavi et al., 2014), **problem solving innovation:** is to start activities that have a positive impact on the organization, and it is expected from them to change and start activities that lead to solving problems and improving work. (Alavi et al., 2014). **Professional flexibility:** It is the employee effective performance under pressure resulting from changing the environment and the applied strategies and solutions, which is reflected in a positive impact that leads to new ideas and technological techniques and dealing with the unexpected situation and pressures (Alavi et al., 2014), this may result in the employee's ability to tackle problems to achieve the organization's goals and move flexibly and effectively (Muduli, 2013). **Bearing work pressure:** It is the employee's ability to withstand the conditions that lead to stress and pressures in the situations that the individual is exposed to at his work, stress does not match the physical and psychological changes with individuals who cannot deal with work requirements (Mohammad et al., 2020). **Learning work skills:** It is learning new ways to perform jobs and teaching workers new skills through training programs provided by the organization, which is the mainstay of human resources that keeps pace with rapid developments and helps in training workers to prepare for a new job or profession in the organization (Allahow et al., 2018).

2.2 Job Performance

Performance has received great attention in human resource studies because of its importance to the individual (Al-Hawary & Alajmi, 2017). Organization and task performance are defined as the implementation of job burdens for employee responsibilities and duties (Mohammad, 2019). The success of performing the task depends mainly on the workoutcome, which has a strong relationship with the organization strategic objectives, customer satisfaction and economic development (Al-Hawary & Hadad, 2016; Al-Hawary & Obiadat, 2021; Al-Nady et al., 2013, 2016; Alolayyan et al., 2018; Alshurideh et al., 2017a, 2017b; Muhtasom et al., 2017). General concept of job performance can be developed as the extent to which the managerial processes that are accomplished in a specific period of time conform to the pre-established plans, identify weaknesses, and develop scientific and practical solutions. And give workers the chance to follow their needs, self-esteem, self-follow and respect for others (Al-Hawary & Hadad, 2016; AlShehhi et al., 2020; Alsuwaidi et al., 2020).

Employee performance is the main factor to achieve the organization goals that must be focused on, by achieving performance in light of work such as: job positions, job satisfaction, commitment to accomplish the task (Ghani et al., 2016; Al-Dhuhouri et al., 2020). It is also certain that job performance refers to the total value expected to organize the separate behaviour that the individual implements within a short period of time so that we obtain the expected quality and quantity from an employee in a particular job, and this is evidence that individual performance is the basis of motivation, willing and ability to do this task (Mohamad & Jais, 2016; Nuseir et al., 2021). Here we can define job performance in general as a set of processes that determine and measure the employee's performance and their rewards for the efforts they make to achieve what is required. Also, job performance may be defined as the degree of achievement and tasks completion that make up an individual's job that is reflected in job requirements fulfilment that often overlap between performance and effort, while effort refers to the energy expended, performance is measured on the results achieved by the individual (Al-Haddad, 2016; Al Mehrez et al., 2020). While some defined job performance as the employee's ability to complete the tasks assigned to him and contribute to the achievement of organization's goals. The employee's performance is inspired by a sense of job affiliation and thus to obtain efficiency and effectiveness in the workplace. (Adagbabiri & Okolie, 2019; Odeh et al., 2021).

There are several dimensions that were addressed in previous studies regarding job performance, but the focus of most researchers revolved around two of these dimensions, namely "context performance" and "task performance". In this study, we address these two dimensions; **Tasks performance:** which is related to the work plan construction and through which all planning and coordination skills are used to achieve the required performance. **Contextual performance:** called organizational citizenship behavior such as protecting, volunteering, and helping others to develop at work.

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Although job performance dimensions are task performance and contextual performance, but it is necessary to separate them when processing, it is not a condition that they occur together. For example, the employee may be high-performance in performing the tasks, but is weak in providing a good environment to increase organization effectiveness or provide assistance to others. Task performance is the activities and plans that help transform raw materials into goods and services by obtaining individuals and using distributors to sell goods and services using all planning and supervision skills to ensure that the organization performs its functions efficiently and effectively. Contextual performance is what concerned with achieving the organization effectiveness through providing a good environment for performing tasks, including behaviours such as staying motivated and making extra effort, volunteering to carry out activities, helping and cooperating with others, a commitment to follow organizational rules and procedures, providing support to others and defending the organization goals.

2.3 Human Resource Agility and Job Performance

Taran (2019) asserts that healthcare organizations are subject to change and this may lead organizations to invest in developing workforce agility and resilience where social change in people is facilitated by creating societies that adapt in an optimistic way and find opportunities that benefit society even through negative changes. Workforce agility can be built by encouraging the capabilities of: learning, teamwork, problem solving, information seeking and decision-making, and failure to adapt to change is a major barrier to workforce agility, which necessitates companies to develop workforce agility dynamic ability (Onyait, 2019). According to Harikrishnan and Suresh (2018), age, health status, and work environment are the critical factors that influence workforce agility. Ogbo & Wilfred (2014) confirmed that there is an impact of the diversity of workforce agility on improving organizational performance, and that education has an impact on workforce agility, which often affects the increase in corporate profitability. Azuara (2015) presented an evidence supports the need for more future research, in order to deepen the understanding of the mechanisms related to human resource agility evolution and the main challenges that leaders face in implementing workforce agility. There are many studies that confirm the positive relationship between the individual components of workforce agility and organizational intelligence, and the positive relationship between workforce diversity and agility (Sohrabi, Asari & Hozoori, 2014). The workforce agility also has a significant impact on organizational memory (Al-faouri, Al-nsour & Al-kasasbeh, 2013). Today's business environment has put pressures on the organization to build human resources agility (workforce), improve the performance of its ability to adapt to the environment, its effectiveness and its implementation on time, agility has emerged as a new single solution to manage a dynamic environment and has become a vital factor for the success of contemporary organizations today (Al-faouri, Al-nsour & Al-kasasbeh, 2013; Lee et al., 2022a, b). Effective use of the workforce is a critical

factor in the long-term for the organization to succeed and that agility depends on smart people rather than systems and human resource capabilities that affect job performance and enhance chances of organization to survive in the competitive environment (Alavi, 2016). Based on the literature review above, the study hypothesis can be formulated as follows:

There is no statistically significant effect of human resource agility on job performance in Islamic banks operating in Jordan.

3 Methodology

3.1 Population and Sample Selection

A qualitative method based on a questionnaire was used in this study for data collection and sample selection. The major aim of the study was to examine the impact of human resources agility on job performance. Therefore, it focused on Islamic banks operating in Jordan. Data were primarily gathered through self-reported questionnaires creating by Google Forms which were distributed to a random stratified sample of (242) managers via email. In total, (173) responses were received including (25) invalid to statistical analysis due to uncompleted or inaccurate. Hence, the final sample contained (148) responses suitable to analysis requirements that were formed a response rate of (61.16%), where it proved to be sufficient to the extent that was predictable and allowed for a presumption of data saturation (Sekaran & Bougie, 2016).

3.2 Measurement Instrument

A self-reported questionnaire that consists of two main sections along with a section regarding control variables was used as the measurement instrument. Control variables considered as categorical measures were composed of gender, age group, educational level, and experience. The two main sections were dealt with a five-point Likert scale (from 1 = strongly disagree to 5 = strongly agree). The first section contained (21) items to measure human resources agility based on (Hozoori, 2014). These questions were distributed into dimensions as follows: three items dedicated for measuring adaptation ability, four items dedicated for measuring problem solving creativity, five items dedicated for measuring professional flexibility, five items dedicated for measuring learning work skills, and four items dedicated for measuring bearing work pressure. Whereas the second section included (10) items developed to measure job performance according to what was pointed by (Arocas & Del Valle, 2021; Xie & Li, 2021). This variable was a second-order construct divided into two first-order

constructs. Task performance measured by three items, and contextual performance measured using seven items.

4 Findings

4.1 Measurement Model Evaluation

This study was conducted structural equation modeling (SEM) to test hypotheses, which represents a contemporary statistical technique for testing and estimating the relationship between factors and variables (Al-Adamat et al., 2020; Al-Gasawneh et al., 2020; Wang & Rhemtulla, 2021). Accordingly, the reliability and validity of the constructs were tested using confirmatory factor analysis (CFA) through the statistical program AMOSv24. Table 1 summarizes the results of convergent and discriminant validity, as well the indicators of reliability.

Table 1 shows that the standard loading values for the individual items were within the domain (0.697–0.909), these values greater than the minimum retention of the elements based on their standard loads (Al-Lozi et al., 2018; Sung et al., 2019). Average variance extracted (AVE) is a summary indicator of the convergent validity of constructs that must be above 0.50 (Howard, 2018). The results indicate that the AVE values were greater than 0.50 for all constructs, thus the used measurement model has an appropriate convergent validity. Rimkeviciene et al. (2017) suggested the comparison approach as a way to deal with discriminant validity assessment in covariance-based SEM. This approaches based on comparing the values of maximum shared variance (MSV) with the values of AVE, as well as comparing the values of square root of AVE ($\sqrt{}$AVE) with the correlation between the rest of the structures. The results show that the values of MSV were smaller than the values of AVE, and that the values of $\sqrt{}$AVE were higher than the correlation values among the rest of the constructs. Therefore, the measurement model used is characterized by discriminative validity. The internal consistency measured through Cronbach's Alpha coefficient (α) and compound reliability by McDonald's Omega coefficient (ω) was conducted as indicators to evaluate measurement model. The results listed in Table 1 demonstrated that both values of Cronbach's Alpha coefficient and McDonald's Omega coefficient were greater than 0.70, which is the lowest limit for judging on measurement reliability (De Leeuw et al., 2019).

4.2 Structural Model

The structural model illustrated no multicollinearity issue among predictor constructs because variance inflation factor (VIF) values are below the threshold of 5, as shown

Table 1 Results of validity and reliability tests

Constructs	1	2	3	4	5	6	7
1. ADA	**0.765**						
2. PSC	0.384	**0.858**					
3. PRF	0.415	0.425	**0.798**				
4. LWS	0.388	0.391	0.411	**0.831**			
5. BWP	0.402	0.362	0.382	0.441	**0.845**		
6. TAP	0.594	0.612	0.564	0.637	0.581	**0.772**	
7. COP	0.541	0.574	0.577	0.625	0.557	0.639	**0.816**
VIF	2.047	1.985	1.564	2.294	2.554	–	–
Loadings range	0.697–0.855	0.814–0.889	0.743–0.869	0.721–0.905	0.701–0.909	0.721–0.834	0.710–0.901
AVE	0.585	0.737	0.637	0.691	0.714	0.596	0.666
MSV	0.412	0.512	0.425	0.502	0.487	0.461	0.506
Internal consistency	0.806	0.916	0.895	0.915	0.907	0.812	0.814
Composite reliability	0.808	0.918	0.897	0.918	0.908	0.815	0.816

Note ADA: adaptation ability, PSC: problem solving creativity, PRF: professional flexibility, LWS: learning work skills, BWP: bearing work pressure, TAP: task performance, COP: contextual performance, bold fonts refer to square root of AVE

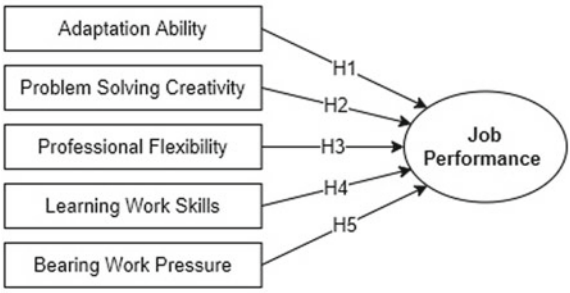

Fig. 1 Research model

in Table 1 (Hair et al., 2017). This result is supported by the values of model fit indices shown in Fig. 1.

The results in Fig. 1 indicated that the chi-square to degrees of freedom (CMIN/DF) was 1.648, which is less than 3 the upper limit of this indicator (Fig. 2). The values of the goodness of fit index (GFI), the comparative fit index (CFI), and the Tucker-Lewis index (TLI) were upper than the minimum accepted threshold of 0.90. Moreover, the result of root mean square error of approximation (RMSEA) indicated to value 0.046, this value is a reasonable error of approximation because it is less than the higher limit of 0.08. Consequently, the structural model used in this study was recognized as a fit model for predicting the job performance and generalization of its result (Ahmad et al., 2016; Shi et al., 2019). To verify the results of testing the study hypotheses, structural equation modeling (SEM) was used, the results of which are listed in Table 2.

The results demonstrated in Table 2 show that most human resources agility dimensions had a positive impact on job performance except adaptation ability ($\beta = 0.107$, $t = 1.207$, $p = 0.228$) and problem-solving creativity ($\beta = 0.027$, $t = 0.508$, $p = 0.612$). However, the results indicated that the highest impact was for learning work skills ($\beta = 0.412$, $t = 8.905$, $p = 0.000$), followed by professional flexibility ($\beta = 0.352$, $t = 3.952$, $p = 0.000$), and finally the lowest impact was for bearing work pressure ($\beta = 0.268$, $t = 3.501$, $p = 0.000$).

5 Discussions

The results indicated that the bank employees deal with various situations and overcome the consequences, and this is what characterized employees with the ability to understand the complex ideas of effective adaptation to the environment, furthermore the employees are able to face sudden changes in the environment so that the bank employees can respond to unexpected changes in the internal and external environment. The researcher believes that the workers in Islamic banks have the responsibility towards performing their work so that the workers have creative solutions to solve work problems, and the workers present creative ideas to take decisions related

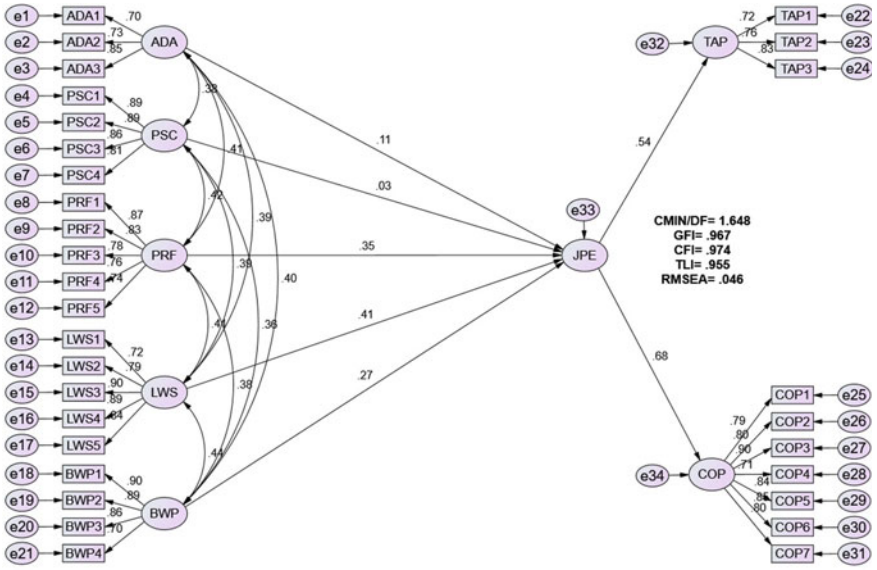

Fig. 2 SEM results of the human resources agility effect on job performance

Table 2 Hypothesis testing

Hypothesis	Relation	Standard Beta	*t* value	*p* value
H1	ADA → JPE	0.107	1.207	0.228
H2	PSC → JPE	0.027	0.508	0.612
H3	PRF → JPE	0.352	3.952***	0.000
H4	LWS → JPE	0.412	8.905***	0.000
H50	BWP → JPE	0.268	3.501***	0.000

Note ADA: adaptation ability, PSC: problem solving creativity, PRF: professional flexibility, LWS: learning work skills, BWP: bearing work pressure, JPE: job performance, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

to solving work problems so that teamwork and an effective communication system contribute to providing creative solutions to work problems, and that the work nature these banks Islamic need creativity in solving problems. It was found that employees of Islamic banks operating in Jordan are keen to participate in training courses and bear work pressures in order to achieve the investigated Islamic banks objectives.

Team members exchange knowledge and ideas, Staff actively participate in group discussions, work, and meetings in banks. Staff like to deal with additional responsibilities, and communicate effectively with colleagues to solve problems and make decisions in Islamic banks. The study found that dimensions of human resource agility availability affects Islamic banks performance, the bank's ability to adapt to environmental changes, and creatively solve problems facing the bank, as well as the

bank's employees flexibility and their ability to learn the new methods entrusted to them, and learning new ways of dealing with others, and bearing the various work pressures in the bank quickly enough, all of this effectively contributed to increasing job performance in Islamic banks operating in Jordan. This is in agreement with the following studies (Al-faouri, Al-nsour & Al-kasasbeh, 2013), (Ogbo & Wilfred, 2014) and (Sohrabi, Asari & Hoozoori, 2014) that examines the relationship between workforce agility and organizational intelligence. These studies also showed a relationship between workforce agility and organizational intelligence, and this is consistent with the current study of the presence of an impact of human resources agility on job performance in Islamic banks operating in Jordan, but differed individually (adaptation ability, creativity in solving problems) because there was no insignificant effect in the current study. It also agreed with Mohammad's (2019) study.

6 Recommendations

Through the study findings, the researcher made a number of recommendations for managers and decision-makers in Islamic banks. The researcher aims behind these recommendations to enhance the desired benefits from human resource agility application, and among these recommendations: Strengthening the interest in practicing the ability to adapt, and the necessity of paying attention to the employees of Islamic banks operating in Jordan in order to face any sudden changes in the environment through training. And the promotion of interest in practicing creativity in solving problems and the need to develop an effective communication system in Islamic banks operating in Jordan in order to provide the best solutions to the problems faced by workers in the studied banks. Overcoming situations in order to achieve the highest level of performance among employees. Exploiting the creativity dimensions, the effective communication system, and the responsibility towards the employees' performance in solving the problems they have to achieve the highest levels of job performance.

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The Impact of Strategic Orientation on Organizational Ambidexterity at the Hotels Sector in Jordan

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Abstract The aim of the study was to examine the impact of strategic orientation on organizational ambidexterity. Therefore, it focused on five-star hotels in Jordan. Data were primarily gathered through self-reported questionnaires created by Google Forms which were distributed to a random-stratified sample of (215) managers. In total, (193) responses were received including (8) invalid to statistical analysis due to

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_61

uncompleted or inaccurate. Hence, the final sample contained (185) responses suitable to analysis requirements. Structural equation modeling (SEM) was conducted to test hypotheses. The results showed that strategic orientation had a positive impact on organizational ambidexterity. Moreover, the results indicated that the highest impact was for technology orientation. Based on the study results, the researchers recommend hotel managers to develop strategic directions by updating their general strategies to contribute to increasing the market share compared to other competing hotels.

Keywords Strategic orientations · Organizational ambidexterity · Hotels' sector · Jordan

1 Introduction

Strategic directions represent the outlines of the organizations strategies when they little details of the strategy content and the strategy implementation, In order to make strategies and take decisions about organizations, there must be leaders with a vision that is compatible with creative and innovative thinking in drawing strategic directions, which is a tool for coordinating the organization efforts (Al-Hawary & Al-Syasneh, 2020; Al-Hawary & Hadad, 2016; Al-Nady et al., 2013; AlTaweel & Al-Hawary, 2021). The idea of organizational ambidexterity came as one of those trends through which organizations can face challenges and environmental changes and stand strong towards them for their survival and continuity in their work performance. Organizational ambidexterity topic has captured the attention of many researchers, as organizations must be exceptionally ambidextrous and simultaneous to strike a balance between exploratory and exploitative activities.

The tourism sector is based on a number of components, including the facilities availability, and tourist facilities that provide services that tourists need during their trips, and the most important of these establishments are hotels, as they are those facilities that provide places for housing and sleeping, in addition to many Of services it provides, so hotels presence in the countries has become indispensable, given the volume of services provided by such establishments, and among the most important hotels are the international five-star hotels. Through previous literature review, it was found that few studies employ the approach (strategic directions) in the study of organizational ambidexterity, especially in hotels in Jordan, so this research is a new contribution within the Jordanian environment, specifically the hotel sector, the research also provides evidence that can be used by hotel managers in Jordan to keep pace with the rapid developments by highlighting the importance of the impact of strategic directions in achieving organizational ambidexterity.

The hotels sector has become a major focus in the revitalizing tourism process in Jordan, as it is a supportive and enhancing sector for the tourism movement, and because of the great similarity in the services provided by hotels, and the rapid development and emergence of the globalization concept and its applications, the hotel

sector has put the hotel sector in front of great challenges and competitors, especially the crises of (Corona crisis), emphasized to the senior and middle management in the hotel sector the importance of adaptation and the ability to move quickly towards exploring new opportunities for the purpose of survival in the current and future environment (Alaali et al., 2021; Aljumah et al., 2021; Al-Hamad et al., 2021; Nuseir et al., 2021). The challenges facing the hotel sector require adopting new methods that enable it to explore the opportunities surrounding it and at the same time working to exploit those opportunities according to structurally independent teams capable of changing their structures according to that environment requirements, and for the purpose of balancing these methods requires following what is called organizational ambidexterity. (O'reilly & Tushman, 2013). However, the development of (dynamic) capabilities is important for the hotel sector to balance the activities of exploring new opportunities and exploiting current opportunities, which represent the main challenge to reach the hotel sector level, which represents the transition from the current situation to the future change management, so it is necessary to adopt strategic directions through develop strategies characterized by high flexibility to move from one strategic option to another and according to the conditions imposed by the environment surrounding the hotel sector.

2 Literature Review and Hypotheses Development

2.1 Strategic Orientation

The performance concept always contributes to the strategic goals achievement, the performance concept has become included in strategic thinking and its directions, and the organizations' goal has now become to achieve high strategic performance levels in the field of their activities. It is necessary to improve performance and develop organizations, which is no longer optional but has become an essential condition to ensure survival and continuity (Wheelen & Hunger, 2008; Al-Hawary, 2011; Al-Hawary, 2013; Al-Hawary et al., 2013; Metabis & Al-Hawary, 2013; Al-Hawary & Abu-Laimon, 2013; Al-Nady et al., 2016: Al-Lozi et al., 2017; Alshurideh et al., 2017; Allahow et al., 2018; Alolayyan et al., 2018; Alhalalmeh et al., 2020; Al-Quran et al., 2020; Mohammad et al., 2020). Strategic directions are defined as a specific approach that the organization applies to reach superior and continuous performance in the course of its work, as strategic directions work to establish an approach linked to the goals of improving the organization's permanent performance, and reflecting managers' awareness of the surrounding environment and their reactions to environmental conditions (Jandab, 2013; Kabrilyants et al., 2021; Tariq et al., 2022). Strategic directions importance lies in the organization's compatibility of its resources with current opportunities, and it also helps the organization to be more compatible and adaptive to the surrounding environmental changes, and helps to explore new markets, work on developing radical innovations, and finding behaviors

that help the organization achieve superior performance. (Al Suwaidi et al., 2020; Alameeri et al., 2021; Alshurideh et al., 2019; Alzoubi et al., 2022; Slater & Oslan, 2001).

There are dimensions of strategic directions, three of which have been selected because they represent a comprehensive set of strategic directions critical to the organization success. (Covin & Slevin, 1989; Narver & Slater, 1990) includes: **Market Orientation**: which is defined as the organization's culture that finds the most effective necessary behaviors to provide the greatest value to customers (Narver & Slater, 1990), market orientation is part of the organizations culture, which poses a challenge to any organization that has few technological capabilities available to it and which are scarce in these markets, and whose markets are characterized by stereotyping and must subject its requirements to continuous innovation to achieve more productivity at a lower cost. **Entrepreneurial orientation**: which is the organization ability that makes it possess the desire to innovate and to act independently and the tendency to take risks in order to meet the future customers' requirements in the market. It is also concerned with the organization strategic leadership aspects, and that today's business environment is more dynamic, so markets and organizations must achieve the competitive advantage that distinguishes them from other competitors. **Technology Orientation** which is defined as the ability to obtain modern technological knowledge and use it in the new products development, and it is also known as the use of advanced technologies in the development of new products, the new technology rapid integration, and the new product ideas proactive creation. (Gatignon & Xuereb, 1997, 78, 82).

2.2 Strategic Ambidexterity

Organizational ambidexterity has dealt with many controversial managerial definitions due to the different literary and scientific opinions that dealt with the concept of ambidexterity Organizational ambidexterity, or strategic ambidexterity, and all terms include the process of exploring and exploiting opportunities. Many researchers have addressed the organizational ambidexterity, most notably the organization's simultaneous pursuit of exploration and exploitation activities (Jansen et al., 2009). Ambidextrous organizations are superior organizations that enable innovation by exploiting their existing products and exploring new opportunities to promote more radical innovations (Andriopoulos & Lewis, 2010). Organizational ambidexterity is the organizations need to strike a balance between exploitation and exploration to achieve superior performance. The organizational ambidexterity importance is reflected in enabling organizations to achieve the goal of long-term survival in order to ensure continuity and future growth. (Yigit, 2013). Through the research and development processes in the organization, it enables the working managers to work through the information and various alternatives presence for the decisions in order to reduce the conflict between the exploration and the exploitation activities. (Prange & Schlegelmich, 2009).

There are two dimensions that the researcher identified for organizational ambidexterity as discussed by Bodwell and Chermack (2010) and Cao et al. (2009) which are: **Exploring Opportunities**: which represents the organization's ability to move quickly to explore new opportunities, prepare to adapt to volatile markets, leads to the new customers and markets emergence, new distribution channels creation, and the exploration of new opportunities requires new knowledge that is completely different and distinguished by research, difference, and flexibility. **Opportunity Exploitation**: which is the organization ability to improve activities to generate value in the short term, as it is designed to meet current customers' needs in the current markets, and seeks to expand the knowledge and skills available, and expand the current services and products while increasing the current distribution channels, and that the opportunities exploitation represents the activities of organizational learning, namely, refinement, efficiency, and implementation. And that exploitation is reflected in the organization's evaluation of opportunities in the environment that do not necessarily fall within the scope of its strategies, which is reflected in the identification of future opportunities (Brion & Mothe, 2010).

2.3 Strategic Directions and Organizational Ambidexterity

There are many organizations that are able to pursue innovative and proactive programs in a gradual or radical way, because of their full market orientation, and that linking exploration and exploitation activities leads to enabling new business units to practice market orientation behaviors towards new markets, and to respond quickly to them through its application, Therefore, managers must also arrange product markets in a proactive and rapid manner with market-oriented behaviors at the same time, by allocating the working managers in the organization to tangible and intangible resources (Li et al., 2008, p. 1022). The entrepreneurial orientation indicates that some proactive and innovative organizations adopt risk (Tuan, 2016), and the entrepreneurial orientation strikes a balance and link between exploration and exploitation as a dynamic task rather than as a static match (Westernan, Macfarlan & Iansitti, 2006, 230). There are few studies that dealt with the link between technology orientation and organizational ambidexterity, as pointed by Rotharrmal & Alexandre (2009). Managers in the organization must follow an approach based on modern technology use, through the development of a cost-oriented plan, and to promote high efficiencies and invest in existing markets for products (Kortmann, 2015, p. 3). And some creative organizations are discovering and entering new markets, and using new proactive technology, rather than focusing on existing capabilities and new product markets (Talke, Salomo, Kock, 2011; Almaazmi et al., 2020). Based on the above, study hypothesis can be formulated as follows:

There is a statistically significant impact of the strategic directions on organizational ambidexterity in the hotel sector in Jordan.

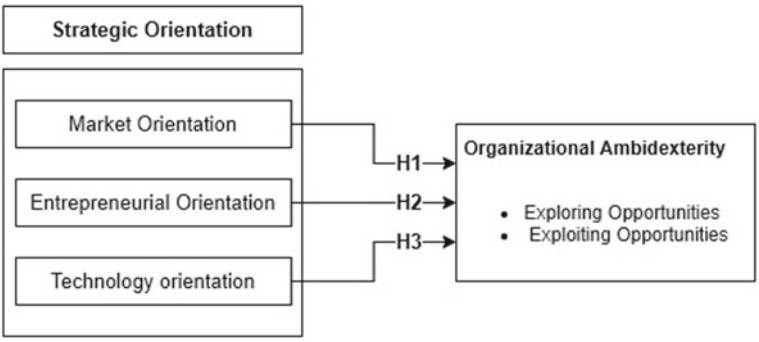

Fig. 1 Research model

3 Study Model

See Fig. 1.

4 Methodology

4.1 Population and Sample Selection

A qualitative method based on a questionnaire was used in this study for data collection and sample selection. The major aim of the study was to examine the impact of strategic orientation on organizational ambidexterity. Therefore, it focused on five-stars hotels in Jordan. Data were primarily gathered through self-reported questionnaires created by Google Forms which were distributed to a random-stratified sample of (215) managers via email. In total, (193) responses were received including (8) invalid to statistical analysis due to uncompleted or inaccurate. Hence, the final sample contained (185) responses suitable to analysis requirements that were formed a response rate of (86.04%), where it proved to be sufficient to the extent that was predictable and allowed for a presumption of data saturation (Sekaran & Bougie, 2016).

4.2 Measurement Instrument

A self-reported questionnaire that consists of two main sections along with a section regarding control variables was used as the measurement instrument. Control variables considered as categorical measures were composed of gender, age group,

educational level, and experience. The two main sections were dealt with a five-point Likert scale (from 1 = strongly disagree to 5 = strongly agree). The first section contained (21) items to measure strategic orientation based on (Beliaeva et al., 2018; Tseng et al., 2019). These questions were distributed into dimensions as follows: seven items dedicated for measuring market orientation, seven items dedicated for measuring entrepreneurial orientation, and seven items dedicated for measuring technology orientation. Whereas the second section included (14) items developed to measure organizational ambidexterity according to what was pointed by (Peng et al., 2019). This variable was a second-order construct divided into two first-order constructs. Exploring opportunities measured by seven items and exploiting opportunities measured using seven items.

5 Findings

5.1 Measurement Model Evaluation

This study was conducted structural equation modeling (SEM) to test hypotheses, which represents a contemporary statistical technique for testing and estimating the relationship between factors and variables (Al-Hawary & Alhajri, 2020; Al-Hawary & Obiadat, 2021; Al-Hawary et al., 2020; Wang & Rhemtulla, 2021). Accordingly, the reliability and validity of the constructs were tested using confirmatory factor analysis (CFA) through the statistical program AMOSv24. Table 1 summarizes the results of convergent and discriminant validity, as well the indicators of reliability.

Table 1 shows that the standard loading values for the individual items were within the domain (0.637–0.864), these values greater than the minimum retention of the elements based on their standard loads (Al-Lozi et al., 2018; Sung et al., 2019). Average variance extracted (AVE) is a summary indicator of the convergent validity of constructs that must be above 0.50 (Howard, 2018). The results indicate that the AVE values were greater than 0.50 for all constructs, thus the used measurement model has an appropriate convergent validity. Rimkeviciene et al. (2017) suggested the comparison approach as a way to deal with discriminant validity assessment in covariance-based SEM. This approaches based on comparing the values of maximum shared variance (MSV) with the values of AVE, as well as comparing the values of square root of AVE ($\sqrt{}$AVE) with the correlation between the rest of the structures. The results show that the values of MSV were smaller than the values of AVE, and that the values of $\sqrt{}$AVE were higher than the correlation values among the rest of the constructs. Therefore, the measurement model used is characterized by discriminative validity. The internal consistency measured through Cronbach's Alpha coefficient (α) and compound reliability by McDonald's Omega coefficient (ω) was conducted as indicators to evaluate measurement model. The results listed in Table 1 demonstrated that both values of Cronbach's Alpha coefficient and McDonald's

Table 1 Results of validity and reliability tests

Constructs	1	2	3	4	5
1. Market Orientation (MO)	**0.749**				
2. Entrepreneurial Orientation (EO)	0.294	**0.757**			
3. Technology Orientation (TO)	0.355	0.364	**0.744**		
4. Exploring Opportunities (ER)	0.415	0.605	0.597	**0.751**	
5. Exploiting Opportunities (ET)	0.524	0.578	0.622	0.615	**0.745**
VIF	2.641	2.078	2.235	– -	– -
Loadings range	0.637–0.824	0.673–0.854	0.656–0.802	0.694–0.833	0.688–0.864
AVE	0.561	0.574	0.554	0.563	0.555
MSV	0.415	0.495	0.503	0.425	0.510
Internal consistency	0.896	0.901	0.894	0.898	0.894
Composite reliability	0.899	0.903	0.896	0.900	0.897

Note Bold fonts refer to $\sqrt{\text{AVE}}$

Omega coefficient were greater than 0.70, which is the lowest limit for judging on measurement reliability (De Leeuw et al., 2019).

5.2 Structural Model

The structural model illustrated no multicollinearity issue among predictor constructs because variance inflation factor (VIF) values are below the threshold of 5, as shown in Table 1 (Hair et al., 2017). This result is supported by the values of model fit indices shown in Figs. 1 and 2.

The results in Fig. 1 indicated that the chi-square to degrees of freedom (CMIN/DF) was 1.739, which is less than 3 the upper limit of this indicator. The values of the goodness of fit index (GFI), the comparative fit index (CFI), and the Tucker-Lewis index (TLI) were upper than the minimum accepted threshold of 0.90. Moreover, the result of root mean square error of approximation (RMSEA) indicated to value 0.019, this value is a reasonable error of approximation because it is less than the higher limit of 0.08. Consequently, the structural model used in this study was recognized as a fit model for predicting the organizational ambidexterity and generalization of its result (Ahmad et al., 2016; Shi et al., 2019). To verify the results

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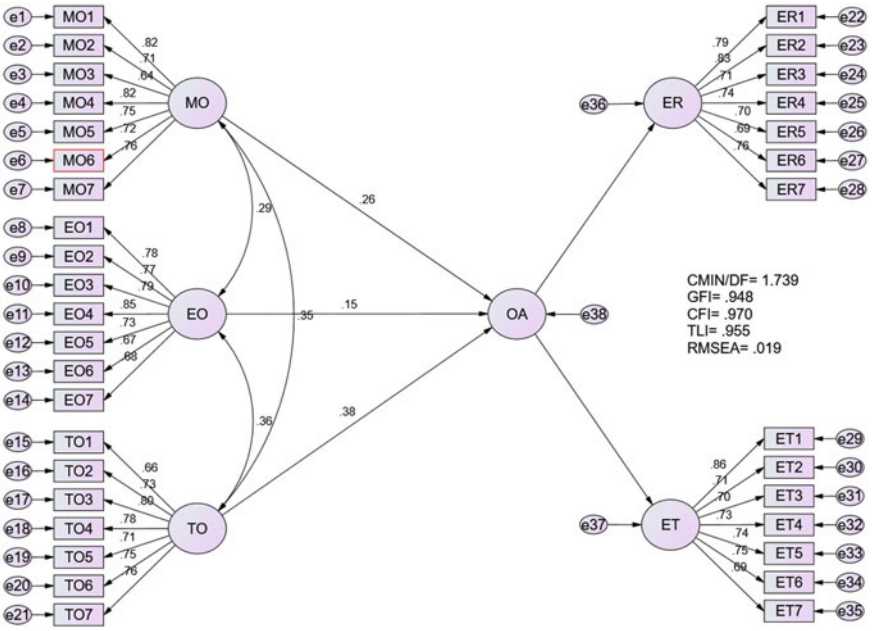

Fig. 2 SEM results of the strategic orientation effect on organizational ambidexterity

of testing the study hypotheses, structural equation modeling (SEM) was used, the results of which are listed in Table 2.

The results demonstrated in Table 2 show that strategic orientation dimensions had a positive impact on organizational ambidexterity. Moreover, the results indicated that the highest impact was for technology orientation ($\beta = 0.380$, $t = 5.924$, $p = 0.000$), followed by market orientation ($\beta = 0.257$, $t = 4.560$, $p = 0.000$), and finally the lowest impact was for entrepreneurial orientation ($\beta = 0.151$, $t = 2.526$, $p = 0.012$).

Table 2 Hypothesis testing

Hypothesis	Relation	Standard Beta	*t* value	*p* value
H1	Market Orientation → Organizational Ambidexterity	0.257***	4.560	0.000
H2	Entrepreneurial Orientation →Organizational Ambidexterity	0.151*	2.526	0.012
H3	Technology Orientation → Organizational Ambidexterity	0.380***	5.924	0.000

Note * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

6 Discussion

The hotel sector management has the ability to form and formulate a strategy that achieves its goals and has the ability to develop its vision and implement it to achieve the desired goals, by activating the role of human capital and paying attention to it, investing in the development of new technology, building an effective organizational culture, as well as establishing strategic oversight facilitate flexibility and encourage innovative behaviors to help obtain superior performance and maintain competitive advantage, study results also revealed that hotels support the market orientation, through the management keenness in the hotel sector to study the market and competitors in order to satisfy customers and know their reactions towards the provided services, and their participation in the new services development, and work to distinguish their services from competitors by providing new offers on those services, The hotel sector management also seeks to study the competitors strengths to be able to develop and improve its services in order to meet the customer's needs, maintain them and attract new customers, the internal environment, and the application of the latest modern work methods in the new hotel services, and this supports the administration's directions in achieving its marketing objectives, profitability, survival and competition.

The results confirm the management's endeavor in the surveyed hotels to achieve leadership in work through the application of a number of practices that confirm the pioneering orientation, including their organizational structures review and development on a continuous basis to adapt to the surrounding developments, and encourage them to present new ideas with the intention of developing and simplifying work procedures and improving the provided service levels, as well as allocating sufficient budgets for the creating new services process, which contributes to achieving its planned goals in short and long-term strategic plans.

The results showed that the surveyed hotels management is taking advantage of the available opportunities to achieve its goals, and to confront environmental challenges in the hotel sector, which is most vulnerable to developments and environmental changes, especially since Jordan has suffered from political events in the Middle East region, as well as the health symptom that the whole world suffers from (Coronavirus). Which necessitates the surveyed hotels management to develop a risk strategy that includes procedures and practices to take advantage of the available opportunities with a view to improving the efficiency of the hotel services provided and investing in new opportunities. The results also confirm that the surveyed hotels management is able to explore the available opportunities and sense the environment in order to improve its services provided to customers and achieve its goals, and its ability to explore opportunities brings it more new customers and makes it able to develop and innovate new hotel services, and exploit the opportunities available by other hotels, as well as creating new outlets in providing its current services, and marketing hotel services that do not exist with competitors, or at least distinguished from competitors, which contributes to increasing the market share compared to competitors.

The results concluded that there is a statistically significant impact of the strategic orientation variable with its dimensions: (market orientation, pioneering orientation, and technology orientation) on organizational ambidexterity in the hotel sector in Jordan. Keeping pace with and using modern technology that fits with the internal environment, applying the latest modern work methods in new hotel services, and striving to achieve leadership in work, this positively affects its ability to achieve organizational ambidexterity in terms of exploring new opportunities and exploiting the current opportunity that is working towards achieving its goals. The application of the latest modern working methods in new hotel services, building new technological solutions to meet customers' needs, and taking the initiative in using advanced technologies in developing new services compared to competitors, supports the management's directions in achieving its marketing objectives, profitability, survival and competition, which means that technology orientation is considered an important factor in achieving organizational ambidexterity in terms of exploring new opportunities and exploiting the available opportunities that work towards achieving its goals (Alshurideh et al., 2012; Al Kurdi et al., 2020a, b; Alshamsi et al., 2020; Alzoubi et al., 2020; Alshurideh, 2022).

The results are agreed with the result of Rady and Qassem (2018), which showed the existence of a positive correlation and effect with significant between strategic directions and organizational ambidexterity. The results are also in agreement with the study of Hijjawi (2019), which showed that regulatory ambidexterity plays an important role in increasing the ability of the Jordanian telecommunications sector to face volatile environmental disruptions.

7 Recommendations

Based on the previous results, the study recommends hotel managers to develop strategic directions by updating their general strategies to contribute to increasing the market share compared to other competing hotels. Increasing interest in the market orientation through a better study of the market and competitors and following more advanced methods for collecting information that improve the quality of the hotel service. The study also recommends enhancing the technology orientation role, so that hotel management uses technology and keeps pace with it constantly, through its development and modernization, and the application of the latest modern work methods in new hotel services, encouraging and supporting new ideas presented by various managerial levels in the hotel sector with the aim of developing and simplifying work procedures and improving the service provided to customers.

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The Effect of Total Quality Management on the Organizational Reputation: The Moderating Role of Quality Standards in Jordanian Public Universities

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Abstract This study aimed to identify the modified role of quality standards in the impact of the application of total quality management on the organizational reputation of Jordanian public universities. The study population consisted of (5477) faculty members in five public universities. The study sample consisted of a proportional stratified sample of (390) individuals, and after the questionnaire was distributed with (410), 390 were recovered, valid for the purposes of statistical analysis. For the purposes of achieving the objectives of the study, multiple regression analysis and the

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_62

multiple hierarchical regression analysis were used. The study results showed that quality standards play a statistically significant role on the impact of total quality management on organizational reputation. The researchers recommend the necessity for Jordanian public universities to pay attention to the standard because of its important role in the application of total quality management, as well as activating the role of accreditation and quality centers and supporting them with all the needs of qualified financial and human resources.

Keywords Total quality management · Quality standards · Organizational reputation · Jordanian Public University

1 Introduction

Total Quality Management, with its dimensions, forms an important interwoven chain in creating a significant competitive advantage and reputation, as evidenced by high-quality inputs and outputs (Aburayya et al., 2020a; Al-Hawary & Abu-Laimon, 2013). While performance indicators are the tools that are used to measure and control the main and subsidiary processes in the administrative systems in order to produce a high-quality end product that reflects a favorable image of the organizations outputs and activities (Al-Hawary & Al-Smeran, 2017; Aburayya et al., 2020b; Al-Quran et al., 2020; Al-Hawary & Obiadat, 2021; AlTaweel & Al-Hawary, 2021). Universities are the most important educational institutions that embrace students, and they are the most important inputs and outputs of the educational process, working to provide them with knowledge, experience, scientific and practical skills, that refine and develop their personality and enable them to provide service, product, and knowledge to their community, to assist it in achieving its goals (Al-Hawary & Alwan, 2016; Al-Hawary & Batayneh, 2010; Al-Hawary, 2010a, 2010b).

Universities are now working to attract and retain the largest number of students in the context of global competition through their reputation, and even help them achieve high performance in an era marked by the renaissance of knowledge and technology, as it no longer recognizes stereotypes, but has become characterized by the multiplicity and diversity of knowledge, and is considered an important indicator in ranking and reputation, and thus the pursuit of excellence in an era marked by the renaissance of knowledge and technology, as it no longer recognizes stereotype (Al-Hawary & Al-Khazaleh, 2020; Alshurideh et al., 2021). Researchers believe that the reputation of Jordanian public universities has been shattered in recent years, not only locally but also among Arab universities, because the modern experience of international university rankings is a modern and contemporary experience that universities in general use to raise their reputation levels. However, it remains constrained by a set of limited and narrow metrics, and because university education has grown dramatically in the last ten years, accompanied by a slew of barriers and challenges,, in addition to shortcomings in implementing the total quality management strategy and quality assurance standards as required, which raises standards and indicators

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of public university success and raises their reputation to wherever they want, which prompted them to seriously adopt the application of total quality management and academic accreditation in higher education institutions, which prompted them to seriously adopt the application of total quality management and academic accreditation in higher education institutions (Bakht, 2015; Shakhatra & Tarawneh, 2019; Al Kurdi et al., 2020a). This research was conducted with the goal of underlining our universities' involvement in the implementation and dedication to total quality management and assurance standards, as well as the fate of their academic and educational reputation on the Arab and worldwide levels.

2 Theoretical Framework and Hypotheses Development

2.1 Total Quality Management

Total Quality Management (TQM) is one of the most prominent modern concepts in management, and as a result of what the market witnessed of a great competitive image, to provide the best products and services to its customers and clients, this competition moved to a sector that was far from this competition due to the different services provided to the beneficiaries, to enter the education sector The circle of competition in providing its educational services in a better and better way than it was before (Al-Hawary, 2013; Al-Nady et al., 2013; Al-Hawary& Al-Menhaly, 2016; Alshurideh et al., 2017; Al-Maroof et al., 2021). As a result, there has been a noticeable increase in the adoption of this concept in higher education institutions, and it has quickly spread from the industrial and production sectors to the education sector, where it has become urgent and necessary as a result of the rapid advancement of knowledge and technology, which has increased competition (Alhalalmeh et al., 2020; Al-Hawary & Al-Syasneh, 2020; Aljumah et al., 2021; Mohammad et al., 2020). And, given that the graduate is (the final service of the educational process), universities must meet and satisfy the needs of society by generating cadres capable of competition, progress, and improvement in an era of globalization and vast knowledge and technology.

The importance of quality in today's organizations is centered on working to keep up with the requirements and levels of quality, as well as the latest work technologies, and to meet the customer's requirements and desires (Abu Qaaud et al., 2011; Al-Hawary et al., 2017; Harahsheh et al., 2021; Hellman & Liu, 2013), as quality plays a major role in achieving the best levels of performance in all areas, and thus achieving expected satisfaction from customers (Alshurideh et al., 2012; Alzoubi et al., 2022; Hellman & Liu, 2013), as quality plays a major role in achieving the best levels of performance in all areas (Alshurideh et al., 2019; Paraschivescu & Caprioara, 2014). Total quality management, according to the researchers, is a philosophy that focuses on reaching the greatest and highest degree of operational quality and performance through the participation of working individuals, continuous improvement processes,

and addressing the needs and wishes of beneficiaries (Krajewski et al., 2013, p.180; Alzoubi et al., 2020). While Hasham (2018) sees it as a management model based on the most efficient use of time, Hasham (2018) sees it as a strategic plan with clear goals that is characterized by constant evaluation, rectification, and successful review. This is due to the fact that quality management and time management work together to increase productivity by lowering mistake rates and preventing waste in the use of various resources, implying that quality management allows us to make better use of our time.

Today, total quality management has become one of the most important factors for achieving competitiveness in organizations, as the increasing demand for quality by customers makes the organization realize the critical importance in applying quality principles to meet this demand in a good way, and thus total quality management has become a major tool to achieve competitive advantage and performance higher (Al-Hawary & Alhajri, 2020; Obeidat et al., 2021), and its application has become one of the most important priorities in developed countries (Almansour, 2012; Alshamsi et al., 2020; Hassan et al., 2013).

2.2 Organizational Reputation

After the tremendous knowledge and technological revolution, our universities have recently experienced rapid and successive changes and challenges, prompting them to reconsider their level of performance by moving from local performance standards to global ones that raise their reputation, which they consider to be one of their intangible assets that they must possess and strive for, and it keeps it at a consistently good level, as it is one of the most important metrics (Al-Lozi et al., 2017; Alolayyan et al., 2018; Allahow et al., 2018). And, because the message of educational institutions is so important in the lives of people and nations at various stages of economic and social development, the goals are no longer traditional in terms of teaching, research, and knowledge, but have expanded to include all aspects of life, technical, scientific, and technological, forcing these institutions to interact with their society in order to understand its desires and needs, and because it is considered the basis for economic and social development, the goals have expanded to include all aspects of life, technical, scientific, and technological, forcing these institutions to interact (Ibrahim, 2011; Metabis & Al-Hawary, 2013; Al-Nady et al., 2016; Alshurideh, 2022).

Organizational reputation, according to Watson and Kitchen (2015), is a strategic asset that is directly tied to market prices. While another point of view suggests that it represents a kind of comprehensive collective representation of the audio-visual developments that the organization will build over time, as well as its organizational identity through performance and behavior, to later reflect the organization's many perspectives (Al-Hawary & Harahsheh, 2014; Al-Hawary & Hussien, 2017; Lee et al., 2022a, b). Othman and Mohammed (2015) divided the concept into four parts: an economic perspective, a characteristic, a behavior indication of competitive

strength, and a behavioral indicator of competitive strength. From the standpoint of the market: It's what's referred to as a brand image in marketing research. The organization's point of view is as follows: It's what researchers observe since it's anchored in the experiences and accomplishments of the people who work there, embodies the organization's culture and identity, and demonstrates high performance and an appropriate working environment. It is concluded from these different definitions that the concept of organizational reputation is: the organization's ability to consolidate the relationship with all influential parties in society, by presenting strategies and plans capable of responding to the requirements and needs of its beneficiaries in the best way, in a way that ultimately leads to increasing and raising its value and competitive reputation among its peers.

The importance of organizational reputation is reflected in what he said (Qarfi & Sahrawi, 2016), that it is a social building that the organization obtains through its stakeholder relationships, and that its good reputation helps to consolidate its relationships with them and with influential parties in society. It is also regarded an essential component in decreasing the dangers that the company may face, as loyal customers bear a portion of the risk, as well as the fact that reputation adds value to the organization's products and services. In addition, the credibility and reliability of the organizational reputation emerges in times of crisis, because it increases organizational effectiveness, and increases the granting of confidence to the organization, by creating a distinct organizational climate that helps it improve and develop the required. The opinions of researchers varied and varied about determining the dimensions of organizational reputation. Walsh et al. (2009) believes that organizational reputation is represented in five important dimensions that are summarized as: orientation to the customer (the beneficiary), the good employer, the financial capacity of the organization, the quality of its products and services, the social and environmental responsibility of the organization. While Harrison indicated that there are eight important dimensions of reputation and they are complementary among them: leadership, financial strength, type of management, customer focus, social responsibility, reliability, and the nature and quality of communications.

2.3 Quality Standards

Quality is one of the most important topics that have become modern today in our society, after the interest in it in the higher education sector has increased significantly and remarkably, as it is considered one of the important means and modern methods for improving the quality and quality of education, and its elevation and advancement in our time, which is the era of excellence, development and quality. Quality has become an urgent necessity that requires educational institutions to catch up with it and adhere to it, for its continuity and better growth. Today, quality standards have become one of the important aspects in higher education, due to their direct impact on the process of improving the educational process (Nazir et al., 2022). The application of these standards is an urgent need to strive towards achieving interaction

and communication with the variables that characterize our modern era, which bears the mark of knowledge, technology and intense competition (AlShehhi et al., 2020; Tariq et al., 2022).

The focus of attention in higher education institutions has now become the application of quality and its standards, as quality assurance depends on the application of methods and principles of total quality management on an ongoing basis, with the aim of development and improvement, and achieving the highest possible level in the practices, operations and outputs of educational institutions and the services provided by them. This is because the education system, like other systems, runs according to certain strategic plans and within a specific environment and conditions, taking into account all the circumstances and factors surrounding its environment in all its aspects.

Al-Sarayra (2008) and Al-Sayed (2012) define quality standards as a set of specifications that establish the requirements for quality systems in different higher education institutions, which it is necessary to put at the beginning of the application stages of the total quality management methodology, to help senior management in measuring the actual results on the basis of it. Without these specifications, the university will not be able to judge its performance, which are represented in admission policies, educational programs, which include (teaching methods, objectives, evaluation system, examinations, quality of faculty and administrative staff, quality of senior management, buildings and physical equipment), which It gives important outputs that meet the needs and requirements of the beneficiaries.

2.4 Total Quality Management, Organizational Reputation and Quality Standards

The researchers point out that quality-related decisions are strategic decisions that must be followed by senior management because they are one of the cornerstones of comprehensive quality management success. Top management should encourage internal and external clients to participate in decision-making, motivate them, and build and strengthen communication channels with them, as well as work on developing training and development methods to benefit from the capabilities and capabilities of its employees by empowering them and delegating powers to them, building a bridge of trust between internal and even external clients requires support. The senior management of quality policies, and their dissemination and inclusion of their strategies by making them an integral part of the organization's culture (Al Kurdi et al., 2020b; Abuhashesh et al., 2021; Odeh et al., 2021).

Al-Sarhan (2021) confirmed that total quality management in universities entails a set of processes through which the university aims to develop and improve the performance of its administrative and academic staff, work on developing study plans, and rehabilitate laboratories and libraries in order to excel in providing educational services, as evidenced by a Positive on the quality of its most important

outputs (the graduates). According to Hiizer and Render, the concept of total quality management in higher education institutions encompasses all of the educational institution's functions and activities, including (teaching methods, curricula, infrastructure, scientific research, buildings, halls and laboratories, grants and missions, and government support), all of which work to improve the educational institution's evaluation. Total quality management in the educational institution: It is a systematic procedural examination of the institution and its academic programs to measure the methodology in it, in terms of planning goals and implementation, and measuring the compatibility between actual practice with work arrangements and planned results, as well as the institution's evaluation processes through learning, improvement, and self-evaluation.

Abu Al-Rub et al. (2010) and Al-Bilawi et al. (2015) pointed to the great importance of standards, if their application through the proper application of total quality management, would enable the administration to solve the problems it faces in scientific ways, and deal with it, through corrective and preventive measures to prevent its occurrence in the future, and there will be opportunities for optimal use of human and material resources, directing its capabilities towards continuous improvement in performance, and further improving the performance of employees through their participation and participation in the decision-making and decision-making process. Thus, we find that universities' interest in total quality and standards for its guarantee, which is reflected positively on their outputs, to provide the labor market with qualified graduates equipped with science and knowledge, and academic and educational experiences, which guarantee their ability, empowerment and involvement in the market locally, Arably and globally, in a way that reflects creativity and excellence. Accordingly, the study hypothesis can be formulated as follows:

There is a statistically significant role for quality standards as a moderate variable in improving the impact of total quality management on organizational reputation in Jordanian public universities.

3 Study Model

See Fig. 1.

4 Methodology

4.1 Population and Sample Selection

A qualitative method based on a questionnaire was used in this study for data collection and sample selection. The major aim of the study was to examine the impact of total quality management on organizational reputation through the mediating role of

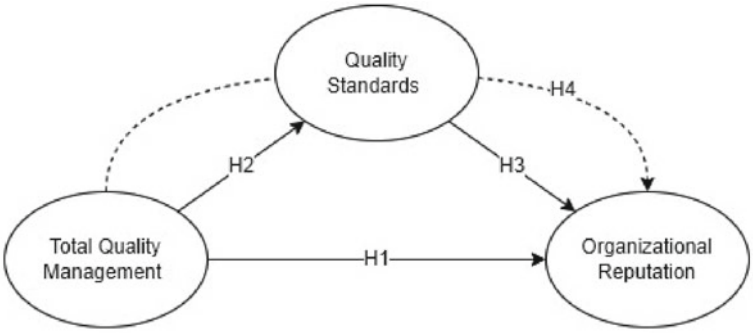

Fig. 1 Research model

quality standards. Therefore, it focused on Jordanian public universities. Data were primarily gathered through self-reported questionnaires creating by Google Forms which were distributed to a stratified sample of (410) faculty members via email. In total, (398) responses were received including nine invalids to statistical analysis due to uncompleted or inaccurate. Hence, the final sample contained (390) responses suitable to analysis requirements that were formed a response rate of (95.12%), where it proved to be sufficient to the extent that was predictable and allowed for a presumption of data saturation (Sekaran & Bougie, 2016).

4.2 Measurement Instrument

A self-reported questionnaire that consists of three main sections along with a section regarding control variables was used as the measurement instrument. Control variables considered as categorical measures were composed of gender, age group, educational level, and experience. The three main sections were dealt with a five-point Likert scale (from 1 = strongly disagree to 5 = strongly agree). The first section contained (20) items to measure total quality management based on (Al-Hawary & Abu-Laimon, 2013). These items were distributed into dimensions as follows: four items dedicated for measuring focus on beneficiary, four items dedicated for measuring senior management commitment, four items dedicated for measuring staff participation, four items dedicated for measuring continuous improvement, and four items dedicated for measuring training and development. The second section related to quality standards variable which contained six items developed according to. Whereas the third section included eight items developed to measure organizational reputation according to what was pointed by (Qarfi & Sahrawi, 2016).

5 Findings

5.1 Measurement Model Evaluation

This study was conducted structural equation modeling (SEM) to test hypotheses, which represents a contemporary statistical technique for testing and estimating the relationship between factors and variables (Wang & Rhemtulla, 2021). Accordingly, the reliability and validity of the constructs were tested using confirmatory factor analysis (CFA) through the statistical program AMOSv24. Table 1 summarizes the results of convergent and discriminant validity, as well the indicators of reliability.

Table 1 shows that the standard loading values for the individual items were within the domain (0.661–0.858), these values greater than the minimum retention of the elements based on their standard loads (Al-Lozi et al., 2018; Sung et al., 2019). Average variance extracted (AVE) is a summary indicator of the convergent validity of constructs that must be above 0.50 (Howard, 2018). The results indicate that the AVE values were greater than 0.50 for all constructs, thus the used measurement model has an appropriate convergent validity. Rimkeviciene et al. (2017) suggested the comparison approach as a way to deal with discriminant validity assessment in covariance-based SEM. This approach is based on comparing the values of maximum shared variance (MSV) with the values of AVE, as well as comparing the values of square root of AVE ($\sqrt{}$AVE) with the correlation between the rest of the structures. The results show that the values of MSV were smaller than the values of AVE, and that the values of $\sqrt{}$AVE were higher than the correlation values among the rest of the constructs. Therefore, the measurement model used is characterized by discriminative validity. The internal consistency measured through Cronbach's Alpha coefficient (α) and compound reliability by McDonald's Omega coefficient (ω) was conducted as indicators to evaluate measurement model. The results listed in Table 1 demonstrated that both values of Cronbach's Alpha coefficient and McDonald's Omega coefficient were greater than 0.70, which is the lowest limit for judging on measurement reliability (De Leeuw et al., 2019).

5.2 Structural Model

The structural model illustrated no multicollinearity issue among predictor constructs because variance inflation factor (VIF) values are below the threshold of 5, as shown in Table 1 (Hair et al., 2017). This result is supported by the values of model fit indices shown in Figs. 1 and 2.

The results in Fig. 1 indicated that the chi-square to degrees of freedom (CMIN/DF) was 2.131, which is less than 3 the upper limit of this indicator. The values of the goodness of fit index (GFI), the comparative fit index (CFI), and the Tucker-Lewis index (TLI) were upper than the minimum accepted threshold of 0.90. Moreover, the result of root mean square error of approximation (RMSEA) indicated

Table 1 Results of validity and reliability tests

Constructs	1	2	3	4	5	6	7
1. FOB	**0.771**						
2. SMC	0.364	**0.741**					
3. SPA	0.445	0.425	**0.755**				
4. CIM	0.468	0.487	0.428	**0.776**			
5. TAD	0.382	0.394	0.468	0.395	**0.771**		
6. QSS	0.597	0.622	0.625	0.585	0.642	**0.761**	
7. ORE	0.625	0.635	0.645	0.671	0.665	0.605	**0.758**
VIF	2.157	1.885	2.364	1.154	1.647	–	–
Loadings range	0.711–0.834	0.685–0.804	0.674–0.858	0.733–0.815	0.661–0.814	0.681–0.825	0.683–0.821
AVE	0.594	0.549	0.570	0.602	0.594	0.580	0.575
MSV	0.464	0.512	0.384	0.336	0.491	0.438	0.449
Internal consistency	0.850	0.827	0.838	0.857	0.852	0.890	0.912
Composite reliability	0.853	0.829	0.840	0.858	0.854	0.892	0.915

Note FOB: focus on beneficiary, SMC: senior management commitment, SPA: staff participation, CIM: continuous improvement, TAD: training and development, QSS: quality standards, ORE: organizational reputation, Bold fonts in the table are the square root of average variance extracted

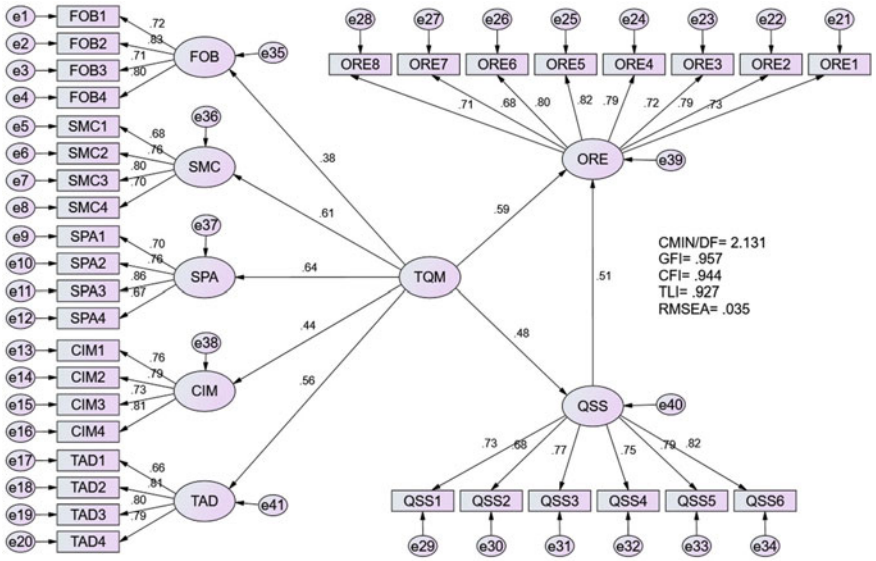

Fig. 2 SEM results of the TQM effect on OR through QS

to value 0.035, this value is a reasonable error of approximation because it is less than the higher limit of 0.08. Consequently, the structural model used in this study was recognized as a fit model for predicting the organizational reputation and generalization of its result (Ahmad et al., 2016; Shi et al., 2019). To verify the results of testing the study hypotheses, structural equation modeling (SEM) was used, the results of which are listed in Table 2.

The results demonstrated in Table 2 show that total quality management has a positive direct impact on organizational reputation ($\beta = 0.594$, $t = 14.568$, $p = 0.000$) and quality standards ($\beta = 0.483$, $t = 10.332$, $p = 0.002$). Moreover, it indicated that quality standards have a positive impact on organizational reputation ($\beta = 0.512$, $t = 13.625$, $p = 0.000$). Hence, quality standards have a partial mediation effect in the relationship between total quality management and organizational reputation, where the total effect was ($\beta = 0.841$, $t = 21.096$, $p = 0.000$) with indirect effect of ($\beta = 0.247$, $p = 0.000$).

Table 2 Hypothesis testing

Relation	**Direct**		**Indirect**		**Total**		
	β	p-value	β	p-value	β	t-value	p-value
TQM → ORE	0.594	0.000	–	–	0.594	14.568	0.000
TQM → QSS	0.483	0.002	–	–	0.482	10.332	0.002
QSS → OPE	0.512	0.000	–	–	0.512	13.625	0.000
TQM → QSS → ORE	0.594	0.000	0.247	0.000	0.841	21.096	0.000

6 Discussion

According to the findings, quality standards as a modified variable has a statistically significant influence on improving the impact of total quality management on organizational reputation in Jordanian public universities. Whereas the results of this study showed that public universities pay attention to the application of quality standards, and this result is consistent with the study, which confirmed through the final result of his study that the increased interest in applying the principles of total quality and its guarantee standards is reflected in higher education institutions' outputs, which will be more innovative, as well as the study, which found that universities meet quality assurance criteria to a great degree. In addition, the results of the study concluded that the Jordanian public universities apply total quality management, and this reflects the awareness and appreciation of universities for the interest in applying the standards and principles of total quality to raise their performance, which will be reflected on their reputation and raise their value.

The results also showed the level of interest of universities to focus on beneficiaries at a low level in providing their services in proportion to their requirements and desires, and this is far from the essence of the principle of focus on the beneficiary, which requires that the administration share with the beneficiaries of its services in presenting their ideas about the services they desire, as well as Take advantage of the feedback through them. Universities are also interested in raising their reputation, through the reputation of their distinguished faculty members, their interest in sending students to study abroad, and building good relations with different countries. The results indicated a high interest on the part of public universities (in academic programs), which is an important criterion for quality assurance in universities, as it is considered one of the factors that attract students.

7 Recommendations

Based on the findings of the study, researchers recommend providing university facilities and buildings, especially teaching halls, with devices, equipment and modern technology that support the educational process and achieve quality goals. Providing a model for measuring the quality of services provided in universities and providing feedback to this model on a continuous basis to identify strengths and weaknesses and work to improve and develop them to achieve quality goals in gaining the satisfaction of the beneficiaries of these services. The researchers recommend increasing the effectiveness of communication between university employees (faculty members and administrators) with the administration, by facilitating access to information, and enabling them to make the decision that enables them to achieve and accomplish their work and develop their level of performance, in addition to the adoption of modern methods by universities in providing their services and activities in a manner that ensures speed response in providing its services. Increasing the dissemination and

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marketing of the services of Jordanian public universities contributes to attracting more students and investors, and increases the focus of the public image of it in their minds; rather, it works to enhance the desire to highlight the university's brand.

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The Impact of Strategic Vigilance on Crisis Management in the Jordanian Dairy Companies: The Mediating Role of Organizational Learning

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Abstract The major aim of the study was to examine the impact of strategic vigilance on crisis management through the mediating role of organizational learning. Therefore, it focused on Jordanian dairy companies. Data were primarily gathered through self-reported questionnaires creating by Google Forms which were distributed to a sample of (285) managers via email. In total, (262) responses were

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_63

received including (16) invalid to statistical analysis due to uncompleted or inaccurate. Hence, the final sample contained (246) responses suitable to analysis requirements. Structural equation modeling (SEM) was conducted to test hypotheses. The results showed that organizational learning plays a partial mediation effect on the relationship between strategic vigilance and crisis management. Based on the results, this study presents a set of recommendations to decision makers in order to better manage the crises facing their organizations.

Keywords Strategic vigilance · Crisis management · Organizational learning · Jordan

1 Introduction

Throughout history, human communities have experienced numerous cyclical or random crises. These crises have resulted in a slew of social, political, and economic ramifications (Coombs & Laufer, 2018). Simultaneously, it lowered the human development curve, which is critical for institutional growth and worldwide competitiveness in today's dynamic business environment (Zulkarnaini et al., 2019; Nuseir et al., 2021a, b). Internal environment variables, such as the bureaucratic regulatory environment, or external environment variables, such as elements of rapid technological progress and the move toward globalization, are commonly responsible for crises (Al-Hawary & Hadad, 2016; Allahow et al., 2018; Al-Hawary et al., 2020; Alhalalmeh et al., 2020; Al-Quran et al., 2020). These factors contribute to the creation of organizational instability, limiting employee innovation and management's capacity to make the appropriate decisions at the right time (Altarifi et al., 2015; Al-Hawary & Al-Syasneh, 2020; Al-Hawary & Obiadat, 2020; Coccia, 2020; Mohammad et al., 2020). With the great changes that the world has witnessed recently related to the dynamic business environment and the spread of the Corona pandemic (Ahmad et al., 2021; Alameeri et al., 2021; Al-Dmour et al., 2021a, b; Alshurideh et al., 2021; Shah et al., 2021), which showed the extent of the fragility of the global system in dealing with crises, organizations are suffering more in maintaining their survival and continuing to provide competitive products and services to their customers by focusing on reducing or avoiding the consequences of successive crises (AlTaweel & Al-Hawary, 2020; Alves et al., 2020; Al-Hawary & Alhajri, 2020).

The ability to analyze the organization's internal and external environments is critical in giving the knowledge needed to make the best decisions at the right time. This necessitated a rethinking of the administrative processes for assessing and forecasting changes in the corporate environment in order to capitalize on opportunities and avoid risks (Al-Hawary & Al-Hamwan, 2017; Al-Hawary & Hadad, 2016; Shalakah et al., 2019). As a result, strategic vigilance has arisen as a management trend that focuses on current information and invests it to forecast future changes in order to provide a prior grasp of the surrounding environment and anticipated adjustments (Alameeri et al., 2020; Jarallah, 2021). Furthermore, it enables the business to cope with large

data, which aids in strengthening the firm's agility and enhancing its ability to attain a holistic strategic goal (Alzoubi et al., 2022; Bettahar & Aggoun, 2021). Strategic vigilance contributes to achieving organizational excellence (Jaaz & Jamal, 2021a, 2021b; Shakhour et al., 2021), improving creativity (Alaali et al., 2021; Ismaail, 2020), and increasing the ability to achieve competitive advantage (Altamony et al., 2012; Manhal & Hattab, 2018).

Furthermore, organizational learning is viewed as a strategic pattern and a driver for bringing about a fundamental shift in traditional thinking, as well as an important catalyst for implementing scientific collaboration and knowledge dissemination approaches (Al-Hawary & Aldaihani, 2016; Al-Hawary & Al-Namlan, 2018; Al-Hawary et al., 2020; Al-Lozi et al., 2017; Ashal et al., 2021; Park & Kim, 2018). Knowledge management methods enable learning organizations to be more flexible and adaptable to changing circumstances, as the accumulation of knowledge contributes to the development of employees' capabilities and skills, as well as motivating them to create products and services that meet the needs of customers (Al-Hawary, 2015; Al-Hawary & Alwan, 2016; Werlang & Rossetto, 2019). Moreover, organizational learning enables effective and efficient investment of various organization resources (Al-Hawary et al., 2020; Alshurideh et al., 2019b) and improved organizational performance (Al Kurdi et al., 2020a; Yuliansyah & Jermias, 2018).

The current study provides a framework for investing the potential of strategic vigilance in enhancing the organization's ability to monitor changes in the business environment and sense potential crises to deal with them proactively, in addition to the mediating role of organizational learning as one of the factors that limit the negative effects of crises. This research helps to throw light on Jordan's dairy industry, which is still reeling from a series of crises brought on by the country's quickly changing commercial environment and substantial technological advancements. Furthermore, it aids in the development of a dynamic strategic approach that enables the business to achieve long-term goals by depending on proactive methods for monitoring changes and reorganizing people and material resources to suit changing client demands. Therefore, this study came to examine the Impact of Organizational Learning On the relationship between Strategic Vigilance and Crisis Management in the Jordanian Dairy Companies.

2 Theoretical Framework and Hypotheses Development

2.1 Strategic Vigilance

By relying on contemporary technology and innovation activities, strategic vigilance plays a critical role in providing the firm with the essential knowledge on many areas of the business environment to discover available possibilities and avoid potential risks (Alshaer, 2020a, 2020b; Alsuwaidi et al., 2020). Strategic vigilance is defined by Drevon (2019) as a systematic, continuous, legal, and ethical process of collecting,

analyzing, processing, and disseminating information, with the goal of assisting senior management, managers, or the entire organization in making better decisions and nurturing strategic thinking through a better understanding of the internal and external environment (Al-Nady et al., 2013, 2016; Hijjawi & Mohammad, 2019). According to Tawfik, early sensing and detection of changes in the business environment's trends is accomplished through the process of continuous monitoring and analysis of the influencing factors in order to extract accurate information and disseminate it throughout the organization's various departments. Furthermore, strategic vigilance was discussed as a sophisticated organizational process that tries to maintain the organization's sustainability and continuity of operations by producing reliable information that helps to reduce the uncertainty associated with decision-making (Alyammahi et al., 2020; Heintz et al., 2016).

The researchers identified the dimensions of strategic vigilance in six dimensions that include various aspects of the internal and external activities of the organization (Lesca, 2003; Drevon, 2019; Alshaer, 2020a, 2020b). **Technological vigilance**, which expresses measures and procedures aimed at revealing the latest technical developments in the business environment and seeking to obtain and employ them to serve the organization (Ahmed et al., 2020; Dawood & Abbas, 2018). **Competitive vigilance** is the organization's mechanism used to identify its current and potential competitors and determine their strengths and weaknesses to support management decisions in following and designing a marketing approach that enables the organization to lead its market sector (Boulifa, 2008; Amarneh et al., 2021). As for commercial vigilance, it focuses on analyzing customer needs and their continuous changes to design products and services that meet their aspirations (Alyasiri, 2019; Almaazmi et al., 2020). **Social vigilance** is the observation of changes in the demographic and cultural composition of community members, which allows the organization to invest its resources in creating products that meet these changes (Dawood & Abbas, 2018; Odeh et al., 2021). **Legal vigilance** is related to following up on the latest developments in the political environment in terms of regulations, laws and legislation governing the mechanism of work in the sectors related to the activities of the organization (Drevon, 2019; Tariq et al., 2022). Finally, **environmental vigilance**, which is concerned with identifying the latest developments, initiatives and laws aimed at controlling the investment of environmental resources and preserving the environment, in order to design strategies and organizational mechanisms that ensure enhancing the ability of subsequent generations to benefit from current resources (Alshurideh et al., 2019a; Lesca, 2003).

2.2 Organizational Learning

Organizational learning and creativity are two modern contemporary notions that have sparked significant interest in the previous two decades, as they were seen as a critical strategic necessity for companies' advancement and survival (Leo et al., 2021). Furthermore, studies have shown that organizational learning improves an

organization's ability to respond to the uncertainty that comes with today's dynamic business environment (Nuseir et al., 2021a, b), creates an opportunity for long-term competitive advantage (Pratono et al., 2019; Obeidat et al., 2021), and transforms the organization into an integrated unit that strives to achieve a common vision (Yoon et al., 2018). As a result, the researchers used a variety of definitions to refer to the concept of organizational learning, which defined by Al-Amyan as "all continuous processes aimed at providing the individual with the necessary skills and knowledge based on prior experiences in order to bring about a relative and permanent change in his scientific inventory. "Organizational learning, according to (Arumugam & Munusamy, 2015), revolves around the organization's ability to improve its employees' skills and capabilities by motivating them to interact, accept positive criticism, and provide an organizational environment that promotes the exchange of knowledge and cumulative experiences. According to Al-Majali, organizational learning is a continuous activity in which an organization strives to organize and expand its employees' knowledge base and continually enhance it in order to reach common ideals that can be used to solve challenges. Some scholars have chosen to use the tripartite model to assess organizational learning, which encompasses the strategic, organizational, and cultural dimensions (Marquardt, 2002). Others such as Taher (2011) who used a four-dimensional model that included technology application, knowledge management, people empowerment, and learning dynamics to measure it.

2.3 Crisis Management

According to Karam (2018), crisis management is a set of actions intended at containing and minimizing the severity of a crisis so that it does not spiral out of control, resulting in a conflict, It is also a set of plans, strategies, methods and administrative activities appropriate to exceptional situations in order to control and contain problems and maintain the organization's balance. According to AlShobaki et al. (2017), disaster preparedness is a broad concept that encompasses planning and responding to a variety of disasters and emergencies. Crisis management is a method that allows an organization to respond in a systematic way to the impacts of a crisis, allowing the business to continue with its everyday activity of supplying products and services to consumers and making profits (Abu Hamadneh et al., 2021; Lee et al., 2022a; Zyead et al., 2017, b).

Furthermore, Sahina et al. (2015) suggested that crisis management is a continuous management process based on the organization's ability to foresee and perceive potential causes that cause crises so that they can be prevented or their effects on the organization's performance can be mitigated. Crisis management, on the other hand, entails making administrative decisions rapidly in crucial situations, as crises force decision-makers in the organization to take immediate action to mitigate the potential effects and risks associated with the occurrence of crises. Hence, crisis management can be described as the art of dealing with the exceptional circumstances facing the

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organization in the turbulent business environment and trying to mitigate its negative effects on the outcome of the organization's work.

2.4 Relationship of Strategic Vigilance in Crisis Management Through Organizational Learning

In today's corporate environment, strategic vigilance has become a necessity, as the organization's operations rely heavily on anticipating and analyzing information about the organization's many aspects and activities, as well as its surrounds, to aid in decision-making. Strategic vigilance, according to Alshaer (2020a, 2020b), is a preventive path that assists decision makers in the organization in anticipating adverse conditions and attempting to avoid them by restructuring organizational resources to face probable dangers. Furthermore, Al-Qutji & Al-Malahsen determined that crisis management is based on a set of organizational strategies to control the sources of the crisis and lessen the organization's negative consequences. As a result, good crisis management relies on correct information gathered in a timely way through strategic vigilance operations in monitoring and forecasting concurrent and possible changes in its analyses.

Furthermore, strategic vigilance contributes to the organization's knowledge store by giving information on many elements of its activities to multiple departments (Idris & Al-Rubaie, 2013). As a result, the organization's competitive advantages are enhanced, and its ability to tackle complex problems posed by the dynamic business environment is improved. It also helps employees increase their ability to adapt to the changing business environment by enhancing the creative components that result in innovative services and products that meet customers' expectations (Shalakah et al., 2019; Alshurideh, 2022).

Furthermore, knowledge generation and dissemination throughout the organization's numerous departments aids in enhancing the ability to detect and respond to change swiftly (Marquardt et al., 2002). Furthermore, understanding of the many facets of the organization's difficulties and crises helps to mitigate the bad effects on its performance while continually attempting to discover inventive and distinctive solutions. The study hypotheses can therefore be written as follows:

There is an impact of Organizational Learning On the relationship between Strategic Vigilance and Crisis Management in the Jordanian Dairy Companies.

3 Study Model

See Fig. 1.

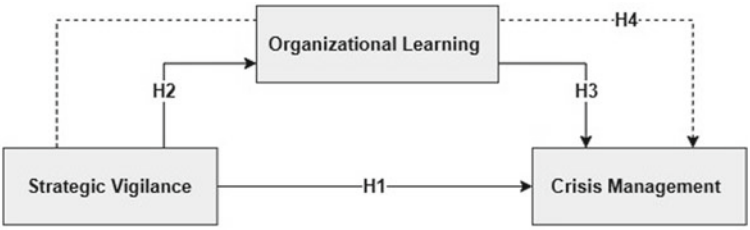

Fig. 1 Research model

4 Methodology

4.1 Population and Sample Selection

A qualitative method based on a questionnaire was used in this study for data collection and sample selection. The major aim of the study was to examine the impact of strategic vigilance on crisis management through the mediating role of organizational learning. Therefore, it focused on Jordanian dairy companies. Data were primarily gathered through self-reported questionnaires creating by Google Forms which were distributed to a sample of (285) managers via email. In total, (262) responses were received including (16) invalid to statistical analysis due to uncompleted or inaccurate. Hence, the final sample contained (246) responses suitable to analysis requirements that were formed a response rate of (86.31%), where it proved to be sufficient to the extent that was predictable and allowed for a presumption of data saturation (Sekaran & Bougie, 2016).

4.2 Measurement Instrument

A self-reported questionnaire that consists of three main sections along with a section regarding control variables was used as the measurement instrument. Control variables considered as categorical measures were composed of gender, age group, educational level, and experience. The three main sections were dealt with a five-point Likert scale (from 1 = strongly disagree to 5 = strongly agree). The first section contained (29) items to measure strategic vigilance based on Alshaer (2020a, 2020b) and Jaaz & Jamal (2021a, 2021b). These items were distributed into dimensions as follows: five items dedicated for measuring technological vigilance, five items dedicated for measuring business vigilance, five items dedicated for measuring social vigilance, five items dedicated for measuring competitive vigilance, four items dedicated for measuring environmental vigilance, and five items dedicated for measuring legal vigilance. The second section related to organizational learning which contained nine items developed according to (Al-Hawary et al., 2020). Whereas the third section

included nine items developed to measure crisis management according to what was pointed by (Al-Khrabsheh, 2018).

5 Findings

5.1 Measurement Model Evaluation

This study was conducted structural equation modeling (SEM) to test hypotheses, which represents a contemporary statistical technique for testing and estimating the relationship between factors and variables (Wang & Rhemtulla, 2021). Accordingly, the reliability and validity of the constructs were tested using confirmatory factor analysis (CFA) through the statistical program AMOSv24. Table 1 summarizes the results of convergent and discriminant validity, as well the indicators of reliability.

Table 1 shows that the standard loading values for the individual items were within the domain (0.591–0.858), these values greater than the minimum retention of the elements based on their standard loads (Al-Lozi et al., 2018; Sung et al., 2019). Average variance extracted (AVE) is a summary indicator of the convergent validity of constructs that must be above 0.50 (Howard, 2018). The results indicate that the AVE values were greater than 0.50 for all constructs, thus the used measurement model has an appropriate convergent validity. Rimkeviciene et al. (2017) suggested the comparison approach as a way to deal with discriminant validity assessment in covariance-based SEM. This approaches based on comparing the values of maximum shared variance (MSV) with the values of AVE, as well as comparing the values of square root of AVE ($\sqrt{}$AVE) with the correlation between the rest of the structures. The results show that the values of MSV were smaller than the values of AVE, and that the values of $\sqrt{}$AVE were higher than the correlation values among the rest of the constructs. Therefore, the measurement model used is characterized by discriminative validity. The internal consistency measured through Cronbach's Alpha coefficient (α) and compound reliability by McDonald's Omega coefficient (ω) was conducted as indicators to evaluate measurement model. The results listed in Table 1 demonstrated that both values of Cronbach's Alpha coefficient and McDonald's Omega coefficient were greater than 0.70, which is the lowest limit for judging on measurement reliability (De Leeuw et al., 2019).

5.2 Structural Model

The structural model illustrated no multicollinearity issue among predictor constructs because variance inflation factor (VIF) values are below the threshold of 5, as shown in Table 1 (Hair et al., 2017). This result is supported by the values of model fit indices shown in Figs. 1 and 2.

Table 1 Results of validity and reliability tests

Constructs	1	2	3	4	5	6	7	8
1. TV	**0.753**							
2. BV	0.315	**0.762**						
3. SV	0.426	0.441	**0.759**					
4. CV	0.339	0.400	0.377	**0.757**				
5. EV	0.381	0.370	0.451	0.415	**0.764**			
6. LV	0.467	0.395	0.422	0.487	0.448	**0.749**		
7. OL	0.514	0.502	0.584	0.612	0.638	0.610	**0.738**	
8. CM	0.553	0.617	0.638	0.644	0.597	0.547	0.665	**0.742**
VIF	2.547	2.087	2.664	1.924	2.743	1.579	–	–
Loadings range	0.682–0.824	0.702–0.811	0.658–0.806	0.691–0.821	0.711–0.858	0.674–0.834	0.591–0.824	0.645–0.795
AVE	0.567	0.581	0.576	0.574	0.583	0.561	0.544	0.550
MSV	0.385	0.457	0.504	0.497	0.442	0.398	0.430	0.465
I.C	0.865	0.873	0.869	0.867	0.845	0.862	0.912	0.915
C.R	0.867	0.874	0.871	0.870	0.848	0.864	0.914	0.916

Note TV: Technological Vigilance, BV: Business Vigilance, SV: Social Vigilance, CV: Competitive Vigilance, EV: Environmental Vigilance, LV: Legal vigilance, OL: Organizational Learning, CM: Crisis Management, I.C: Internal Consistency, C.R: Composite Reliability

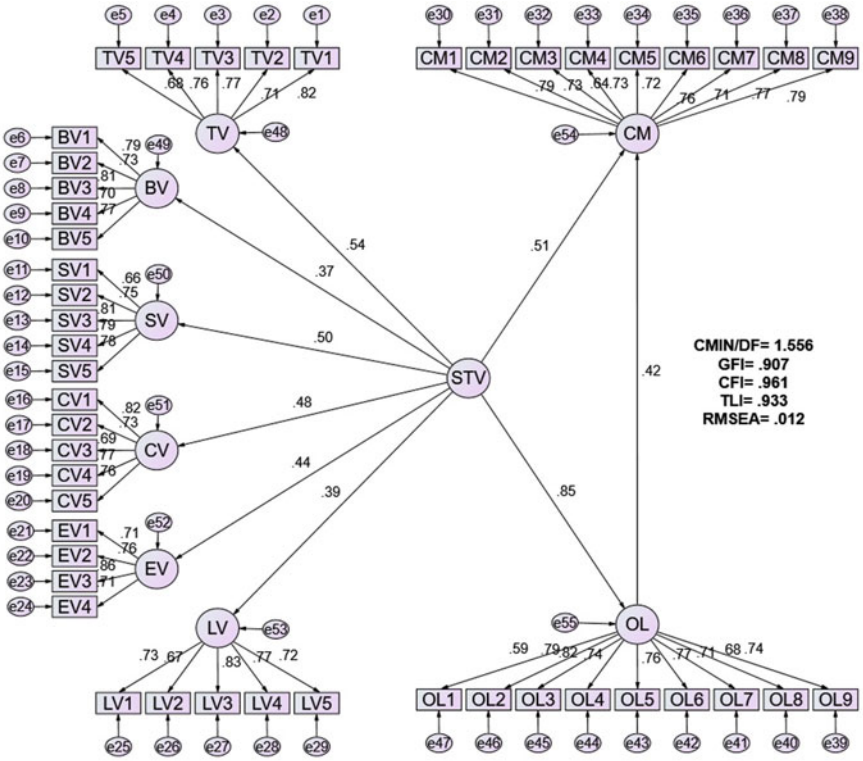

Fig. 2 SEM results of the strategic vigilance effect on crisis management through organizational learning

The results in Fig. 1 indicated that the chi-square to degrees of freedom (CMIN/DF) was 1.556, which is less than 3 the upper limit of this indicator. The values of the goodness of fit index (GFI), the comparative fit index (CFI), and the Tucker–Lewis index (TLI) were upper than the minimum accepted threshold of 0.90. Moreover, the result of root mean square error of approximation (RMSEA) indicated to value 0.012, this value is a reasonable error of approximation because it is less than the higher limit of 0.08. Consequently, the structural model used in this study was recognized as a fit model for predicting the crisis management and generalization of its result (Ahmad et al., 2016; Shi et al., 2019). To verify the results of testing the study hypotheses, structural equation modeling (SEM) was used, the results of which are listed in Table 2.

The results demonstrated in Table 2 show that strategic vigilance has a positive direct impact on crisis management ($\beta = 0.512$, $t = 7.086$, $p = 0.000$) and organizational learning ($\beta = 0.851$, $t = 15.045$, $p = 0.000$). Moreover, it indicated that organizational learning has a positive impact on crisis management ($\beta = 0.419$, $t = 7.778$, $p = 0.000$). Hence, organizational learning plays a partial mediation effect in

Table 2 Hypothesis testing

Relation	**Direct Effect**		**Indirect Effect**		**Total Effect**		
	β	p-value	β	p-value	β	t-value	p-value
Strategic Vigilance → Crisis Management	0.512	0.000			0.512	7.086	0.000
Strategic Vigilance → Organizational Learning	0.851	0.000			0.851	15.045	0.000
Organizational Learning → Crisis Management	0.419	0.000			0.419	7.778	0.000
Strategic Vigilance → Organizational Learning → Crisis Management	0.512	0.000	0.357	0.000	0.870	18.254	0.000

the relationship between strategic vigilance and crisis management, where the total effect was ($\beta = 0.870$, $t = 18.254$, $p = 0.000$) with indirect effect of ($\beta = 0.3557$, $p = 0.000$).

6 Discussion

Through the mediating role of organizational learning, the study attempted to examine the impact of strategic vigilance in crisis management. The findings revealed that strategic alertness has a direct impact on crisis management, which is consistent with previous research (Al-Tanayeeb, 2020). As a result, organizations' pursuit of a technological infrastructure, as well as training employees at various administrative levels to deal with the changing business environment, aids in the early detection of crises and the formulation of preventive plans to mitigate the negative effects of crises. Furthermore, the organization's constant concern and commitment, driven by the desire to achieve industrial leadership, drives it to monitor various aspects of business related to the nature of its activity, enhancing its ability to predict the conditions of the turbulent business environment and take proactive measures to achieve its strategic goals.

The study also found that strategic vigilance has a direct impact on organizational learning, which is consistent with previous findings (Dawood & Abbas, 2018). As a result, in addition to offering current technology to employees, permanent follow-up procedures for laws and legislative regulations contribute greatly to enhancing their ability to deal with difficulties and discover inventive solutions. Furthermore, incorporating environmentally friendly practices into different elements of the organization's operations raises employee awareness of the need to address environmental concerns and fosters a sense of social responsibility toward future generations.

Furthermore, the data revealed that organizational learning has an impact on crisis management, which is consistent with the study's conclusions (Gujarai, 2017). As a

result, creating a work environment that encourages employees to share their previous experiences and skills, allowing them to participate in organizational decision-making, and continuously training them to deal with problems improves the organization's ability to detect flaws in the business environment early and take preventative measures to mitigate their effects and reduce the likelihood of them occurring. Moreover, the results showed that organizational learning plays a mediating role in the relationship between strategic vigilance and crisis management. Therefore, the organization's ability to use modern technology to follow up and control the variables of the business environment and the competitive environment enables it to build a stock of knowledge through which it can deal with the exceptional circumstances that organizations are going through. Moreover, this stock of knowledge, based mainly on accurate and objective information, contributes to supporting the decision-making process and reducing the uncertainty associated with it.

7 Recommendations

Based on the achieved results, this study presents a set of recommendations to decision makers in order to better manage the crises facing their organizations. First, focus on following a supportive management approach to the use of technology in the various activities of the organization because of its impact on enhancing its ability to sense changes in the business environment. Second, providing training programs for employees at various administrative levels on dealing with crises and scientific methods to identify the causes of problems and find appropriate solutions within the constraints of available material resources. Third, enhancing data integration through building an information management system and applying artificial intelligence methods because of their role in disseminating the acquired knowledge in various departments of the organization and enhancing the skills and capabilities of employees to create competitive products and services that take the organization to leadership positions. Finally, forming a crisis management team comprising employees from all administrative levels and training them to deal with fluctuations arising from the turbulent environment, in addition to assigning them to prepare studies and periodic reports on potential problems and the mechanism for dealing with them.

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The Impact of Total Quality Management on the Organizational Reputation

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Abstract The major aim of the study was to examine the impact of total quality management (TQM) on organizational reputation (OR). Therefore, it focused on the faculty members in five public universities, whose number is (5477) faculty members. As for the study sample, it consisted of a proportional stratified sample of (390) individuals, and after the questionnaire was distributed with (410), 390 were recovered, valid for the purposes of statistical analysis. Structural equation modeling (SEM) was conducted to test hypotheses. The results showed that all total quality management dimensions had a positive impact relationship on organizational reputation except focus on beneficiary. Based on the results of the study, researchers recommend managers and decision-makers in public universities to pay attention to

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_64

the university management standard (higher leadership), which has the largest role in supporting and activating the application of total quality management.

Keywords Total quality management · Organizational reputation · Public universities · Jordan

1 Introduction

In today's higher education industry, the concept of total quality has gotten a lot of attention because it is seen as a competitive weapon that will lead to globalization. Universities are regarded as one of the most important tools for societal development and modernization, as well as an important tool for transitioning from their traditional role in activities and operations (educational, academic, and administrative) to a more developed and improving role in these processes to produce high-quality results and outputs regardless of the quantity produced (Alshamsi et al., 2020; Alsharari & Alshurideh, 2020), which prompted it to adopt the philosophy of total quality management in the educational process, and control it with assurance standards and specific indicators and standards, which many researchers considered the ideal solution to make a qualitative leap in the development of its services and outputs, which is reflected positively on its reputation and standing among its peers, this allows it to realize its strategic objectives in moving to global competitive positions among universities throughout the world (Al-Hamad et al., 2021; Leo et al., 2021; Sultan et al., 2021).

The reputation of universities today is considered one of the most prominent and most important standards, which constitute a major challenge that highlights their ability or not to respond quickly to the rapid changes in the surrounding environment, and even have the ability to resolve the vision of stakeholders and beneficiaries towards it, and reflects its ability to attract students and investors (Al Kurdi et al., 2020a; Nazi et al., 2022), which compel universities to join their communities and play a role in them by providing services to their various segments, linking their various specialties to their needs, and linking their research inputs to serve and solve their problems, as well as to create a strong interaction between their resources and the service and production sectors of society (Al-Ta'i & Al-Abadi, 2009; Al-Hawary, 2010a; Al-Hawary, 2010b; Al-Hawary & Batayneh, 2010). Universities today are witnessing efforts to improve their image and reputation by adopting the quality standards required by the most famous international university rankings today, because these rankings reflect a large part of the quality of higher education.

The significance of this research stems from the discussion of comprehensive quality management, including its dimensions and standards, which create an interwoven chain of relevance in creating a significant competitive advantage and reputation, as evidenced by high-quality inputs and outputs (Alshurideh et al., 2021; Amarneh et al., 2021). Given that we are discussing our public universities, the theoretical importance of emphasizing the role of our universities in their application

and commitment to total quality management and assurance standards, as well as linking it to the fate of their academic and educational reputation on the Arab and international levels, is never less than the practical (Altamony et al., 2012; Batayneh et al., 2021).

Public universities today adopt a vision and message of excellence and a strong reputation through the provision of services (academic and pedagogical) and qualitative outputs of high quality and comprehensiveness in their plans and strategies. These are both strategic and operational plans that cover the foundations and concepts of comprehensive quality management in all of its dimensions, as well as the implementation of quality assurance standards in its programs and plans, as well as within specific indicators and standards. Researchers today believe that the reputation of Jordanian public universities has been shaken from before, not only locally, but also among Arab universities as well, because the modern experience of international university rankings is a modern and contemporary experience that universities in general use to raise the level of their reputation, but it is still within a framework limited to some limited and narrow indicators, and because university education has expanded significantly in the past ten years, and its expansion was accompanied by a number of obstacles and challenges (Alshurideh et al., 2019; Al Kurdi et al., 2020b; Alshurideh et al., 2020; AlHamad et al., 2021; Al-Maroof et al., 2021, Nuseir et al., 2021a, b), so this study came to examine the impact of total quality management with its dimensions (focus on the beneficiary, commitment of senior management, continuous improvement, participation of working individuals, training and development) on organizational reputation in Jordanian public universities.

2 Theoretical Framework and Hypotheses Development

2.1 Total Quality Management

Total Quality Management (TQM) is one of the most prominent modern management concepts, and as a result of what the market witnessed of a great competitive image, to provide the best products and services to its customers and clients, this competition moved to a sector that was far from this competition due to the different services provided to the beneficiaries, to enter the circle of competition of the education sector in providing its educational services in a cost-effective manner, after this concept was embodied in an integrated approach of modern management curricula, similar to other concepts that underwent renaissance, progress, and development, and after it was modified to keep pace with today's rapid changes in the environment, it began to focus its attention on achieving quality and excellence to gain customer satisfaction, and it evolved into a philosophy focused on achieving the level of high quality in the performance of operations, in addition to considering it a process that aims to create a distinct culture of performance through persistent pursuit between managers and employees in order to achieve the expectations of the beneficiaries, and to do all

work as required from the first time with better quality, higher effectiveness and in the shortest time (Al-Hawary & Abu-Laimon, 2013; Al-Hawary et al., 2013; Ghoneim, 2018).

Total quality management, according to the researchers, is a philosophy that focuses on reaching the greatest and highest degree of quality and process performance through employee participation, continuous improvement procedures, and addressing the needs and aspirations of beneficiaries (Al-Hawary et al., 2017; Krajewski, et al., 2013; Metabis & Al-Hawary, 2013; Mohammad et al., 2020;). While Hasham (2021) sees it as a management model based on the most efficient use of time, Hasham (2021) sees it as a strategic plan with clear goals that is characterized by constant evaluation, rectification, and successful review. This is due to the consideration that quality management and time management go in one line towards achieving productivity, by reducing error rates, and avoiding waste in the exploitation of various resources, meaning that through quality management we can use time more effectively. We conclude that total quality management is the art of managing the entity of the organization, with all of its parts and components, for the purpose of achieving excellence, and it is a philosophy or set of principles that represent the foundation for any organization that follows a continuous improvement approach, to meet the requirements and needs of its customers in the long run, based on the multiple definitions of researchers about the concept in general.

2.2 Organizational Reputation

The concept of organizational reputation has attracted the attention of many researchers and academics, by noting its results on the work of commercial and service organizations, as the researchers indicated as an indicator for the future of organization (Abdel-Fattah, 2014). Researchers differed about the concept of organizational reputation, some of them saw it as a trait that comes from the advantages that are represented by the values that the beneficiaries realize (Walsh et al., 2004), whereas Watson and Kitchen (2015) see it as a strategic asset that is directly related to market values. While another point of view suggests that it represents a kind of comprehensive collective representation of the audio-visual developments that the organization will build over time, as well as its organizational identity through performance and behavior, to later reflect the organization's many perspectives. Mahdi and Kazem (2017) believe that organizational reputation is a set of relative values (originality, credibility, reliability, integrity, creativity, and social responsibility) that an individual feels about a company through the picture he has of it, and that it is one of its assets. As a result, it has a competitive advantage that helps it attract customers, earn their loyalty, and mitigate competitive threats and crises.

Watson and Kitchen (2015) indicate that the importance of organizational reputation is due to the fact that it is the thought of all stakeholders (internal and external) about the organization's reputation and internal identity, and it is a mixture and

a time-spanned mixture of their evaluation (i.e. stakeholders) about the organization's overall performance, and its ability to face changes and adapt to it. Al-Sharifi (2019) stresses the importance of organizational reputation by highlighting its most important benefits, as it leads to: reducing costs, attracting customers, increasing profitability, setting differentiated prices, and setting competitive barriers to achieve relative stability of competitive future expectations.

According to Oncer & Yildiz (2012), the importance of organizational reputation is reflected in two important aspects: the aspect (external interest of the organization), which refers to the need to protect and improve the organization's reputation as a prerequisite for the continuation of its relationship with stakeholders and customers, which is reflected in its competitive performance; and the aspect (internal interest of the organization), which refers to the need to protect and improve the organization's reputation as a prerequisite for the continuation of While looking at the other side (internal interest), which portrays an acceptable and harmonious image of the organization's internal entity, which shapes its identity and works to improve its performance.

According to Walsh et al. (2009), organizational reputation is represented in five important dimensions that are summarized as: orientation to the customer (the beneficiary), the good employer, the organization's financial capacity, the quality of its products and services, and social responsibility. While Harrison identified eight important elements of reputation that are complementary among them, namely: leadership, financial strength, kind of management, customer focus, social responsibility, reliability, and the nature and quality of communications, adds to them. Market leadership, people quality, and ethical behavior are three more factors (Iwu-Egwuorwu, 2011; Al-Hawary et al., 2020a, 2020b; Al-Hawary & Al-Syasneh, 2020;).

This study will focus on five important dimensions of reputation as follows: **Innovation**: a process that results in unfamiliar ideas for a particular product or service (Al-Hawary, 2015; Al-Hawary & Aldaihani, 2016; AlTaweel & Al-Hawary, 2021; Fichman, 2001). It is the ability to present new ideas that, in turn, bring an organization a competitive advantage (Crossan & Apaydin, 2010; Almaazmi et al., 2020; Nuseir et al., 2021a, b). **Social responsibility**: Alhalalmeh et al. (2020) and Al-Hawary & Al-Khazaleh (2020) defined it as the commitment of business organizations to the community in which they operate, while it is seen as the customers' beliefs about the positive role of the organization toward society and the environment in general (Abu Zayyad et al., 2021; Al-Hawary, 2013; Al-Hawary & Obiadat, 2021; Alolayyan et al., 2018; Walsh et al., 2009). **The strength of the financial position**: It is what customers perceive about the organization in terms of its strength and profitability, and how they evaluate and use financial resources in a responsible manner (Shah et al., 2020, 2021; Walsh et al., 2009). **Product/service quality**: the quality of the service or product can help gain the competitive advantage of the organization, and to maintain a long-term relationship with customers and enhance their confidence in them (Abu Qaaud et al., 2011; Al-Hawary & Al-Menhaly, 2016; Al-Hawary & Al-Smeran, 2016; Alshurideh et al., 2017; Al-Hawary & Alhajri, 2020). **Attractiveness**: It means the ability of the organization to attract workers, investors and customers on an ongoing basis, and work to reduce costs and turnover of its employees. A reputable organization

increases the desire of its employees to stay as well as customers (Al-Hawary & Harahsheh, 2014; Al-Hawary & Hussien, 2017; Ozbag, 2018).

2.3 Total Quality Management and Organizational Reputation

Universities are making attempts to improve their image and reputation by embracing the quality requirements mandated by the most well-known international university rankings, which reflect a significant component of higher education quality. Al-Taher concluded that the process of continuous improvement affects the achievement of competitive advantage, that the process of improvement and development is a shared responsibility among all university employees, that universities are comparing their overall performance with local and international universities, and that the university is working on task forces, conducting studies and analyses of competitive advantage to explore and benefit from strengths, weaknesses, opportunities, and threats, as well as benefiting from foreign expertise related to continuous improvement processes, and conducting studies and analyses of competitive advantage to explore and benefit from strengths, weaknesses, opportunities, and threats. According to Al-Drouqi & Al-Fitni (2021), total quality management is an integrated strategy that contributes significantly to the development of higher education institutions, that the administrative standard is the most important standard of total quality in education, and that the academic accreditation system is the most important mechanism for applying and ensuring quality.

Al-Sarhan (2021) found that public universities have a fundamental interest in two main elements: social responsibility and worker focus, in addition to a noticeable interest in the three TQM variables: organizational culture, focus on developing and improving the educational process, and adopting senior management. The term "total quality management" refers to the management of all aspects of a product's quality. By presenting results that the researcher summarized in the form of important points that dealt with how to pay attention and focus on aspects of total quality management with its principles, through its focus on the mechanisms and means that achieve the best results, (Abu Asba', 2020) confirmed that the five principles of total quality affect the achievement of a competitive advantage. Samir & Sobeih (2020) emphasized that any higher educational institution that wishes to invest and preserve its identity and brand (reputation) pays close attention to all aspects that affect its competitive reputation, such as advertising and promotion that best reflects its institutional image, strategic planning based on attracting components and elements that increase its reputation and raise its corporate brand competitively, and so on.

One of the most crucial variables influencing a student's choice of destination is the university's reputation (Ma, 2021; Al-Maroof et al., 2021). Dursun and Gumussoy

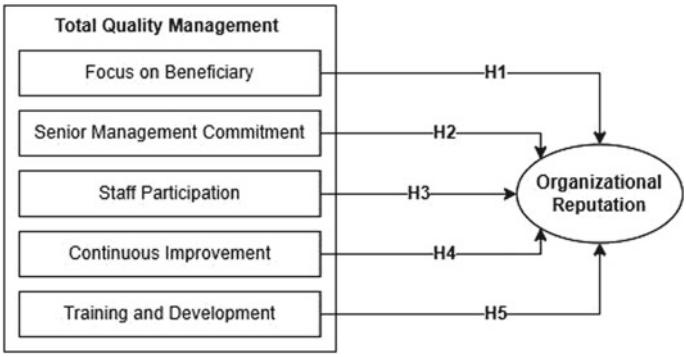

Fig. 1 Research model

(2021) underlined the impact of service quality and emotional dimension on university reputation, as well as demonstrating that personnel competency, academic leadership, and student orientation all have an impact on university reputation. Accordingly, the study hypothesis can be formulated as follows:

There is a statistically significant effect of total quality management with its dimensions (focus on the beneficiary, commitment of senior management, continuous improvement, staff participation, training and development) on the organizational reputation in Jordanian public universities.

3 Study Model

See Fig. 1.

4 Methodology

4.1 Population and Sample Selection

A qualitative method based on a questionnaire was used in this study for data collection and sample selection. The major aim of the study was to examine the impact of total quality management (TQM) on organizational reputation (OR). Therefore, it focused on the faculty members in five public universities, whose number is (5477) faculty members. As for the study sample, it consisted of a proportional stratified sample of (390) individuals, and after the questionnaire was distributed with (410), 390 were recovered, valid for the purposes of statistical analysis (Sekaran & Bougie,

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2016). Data were primarily gathered through self-reported questionnaires creating by Google Forms.

4.2 Measurement Instrument

A self-reported questionnaire that consists of two main sections along with a section regarding control variables was used as the measurement instrument. Control variables considered as categorical measures were composed of gender, age group, educational level, and experience. The two main sections were dealt with a five-point Likert scale (from 1 = strongly disagree to 5 = strongly agree). The first section contained (20) items to measure total quality management based on (Al-Hawary & Abu-Laimon, 2013). These questions were distributed into dimensions as follows: four items dedicated for measuring focus on beneficiary, four items dedicated for measuring senior management commitment, four items dedicated for measuring staff participation, four items dedicated for measuring continuous improvement, and four items dedicated for measuring training and development. Whereas the second section included (12) items developed to measure organizational reputation according to what was pointed by (Abdel-Fattah, 2014).

5 Findings

5.1 Measurement Model Evaluation

This study was conducted structural equation modeling (SEM) to test hypotheses, which represents a contemporary statistical technique for testing and estimating the relationship between factors and variables (Wang & Rhemtulla, 2021). Accordingly, the reliability and validity of the constructs were tested using confirmatory factor analysis (CFA) through the statistical program AMOSv24. Table 1 summarizes the results of convergent and discriminant validity, as well the indicators of reliability.

Table 1 shows that the standard loading values for the individual items were within the domain (0.642–0.892), these values greater than the minimum retention of the elements based on their standard loads (Al-Lozi et al., 2018; Sung et al., 2019). Average variance extracted (AVE) is a summary indicator of the convergent validity of constructs that must be above 0.50 (Howard, 2018). The results indicate that the AVE values were greater than 0.50 for all constructs, thus the used measurement model has an appropriate convergent validity. Rimkeviciene et al. (2017) suggested the comparison approach as a way to deal with discriminant validity assessment in covariance-based SEM. This approaches based on comparing the values of maximum shared variance (MSV) with the values of AVE, as well as comparing the values of square root of AVE ($\sqrt{}$AVE) with the correlation between the rest of the structures.

Table 1 Results of validity and reliability tests

Constructs	1	2	3	4	5	6
1. FOB	**0.742**					
2. SMC	0.384	**0.741**				
3. SPA	0.332	0.392	**0.751**			
4. CIM	0.468	0.374	0.406	**0.759**		
5. TAD	0.501	0.425	0.481	0.443	**0.752**	
6. OR	0.637	0.587	0.662	0.681	0.597	**0.749**
VIF	1.814	1.662	1.876	1.036	1.574	–
Loadings range	0.642–0.793	0.673–0.824	0.705–0.811	0.735–0.771	0.681–0.831	0.662–0.892
AVE	0.551	0.549	0.564	0.576	0.566	0.562
MSV	0.415	0.394	0.497	0.502	0.445	0.381
Internal consistency	0.828	0.826	0.834	0.842	0.836	0.937
Composite reliability	0.830	0.828	0.837	0.844	0.838	0.939

Note FOB: focus on beneficiary, SMC: senior management commitment, SPA: staff participation, CIM: continuous improvement, TAD: training and development, OR: organizational reputation, Bold fonts in the table are the square root of average variance extracted

The results show that the values of MSV were smaller than the values of AVE, and that the values of $\sqrt{}$AVE were higher than the correlation values among the rest of the constructs. Therefore, the measurement model used is characterized by discriminative validity. The internal consistency measured through Cronbach's Alpha coefficient (α) and compound reliability by McDonald's Omega coefficient (ω) was conducted as indicators to evaluate measurement model. The results listed in Table 1 demonstrated that both values of Cronbach's Alpha coefficient and McDonald's Omega coefficient were greater than 0.70, which is the lowest limit for judging on measurement reliability (De Leeuw et al., 2019).

5.2 Structural Model

The structural model illustrated no multicollinearity issue among predictor constructs because variance inflation factor (VIF) values are below the threshold of 5, as shown in Table 1 (Hair et al., 2017). This result is supported by the values of model fit indices shown in Figs. 1 and 2.

The results in Fig. 1 indicated that the chi-square to degrees of freedom (CMIN/DF) was 2.881, which is less than 3 the upper limit of this indicator. The values of the goodness of fit index (GFI), the comparative fit index (CFI), and the Tucker–Lewis index (TLI) were upper than the minimum accepted threshold of 0.90.

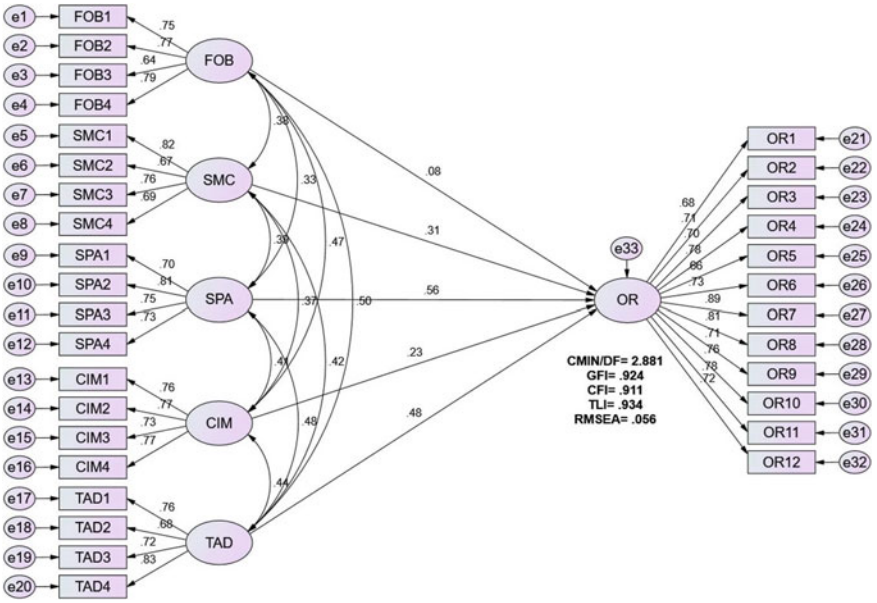

Fig. 2 SEM results of the TQM effect on OR

Moreover, the result of root mean square error of approximation (RMSEA) indicated to value 0.056, this value is a reasonable error of approximation because it is less than the higher limit of 0.08. Consequently, the structural model used in this study was recognized as a fit model for predicting the organizational reputation and generalization of its result (Ahmad et al., 2016; Shi et al., 2019). To verify the results of testing the study hypotheses, structural equation modeling (SEM) was used, the results of which are listed in Table 2.

The results demonstrated in Table 2 show that all total quality management dimensions had a positive impact relationship on organizational reputation except focus

Table 2 Hypothesis testing

Relation	Standard Beta	*t* value	*p* value
FOB → OR	0.083	1.750	0.081
SMC → OR	0.311*	3.297	0.017
SPA → OR	0.561***	9.364	0.000
CIM → OR	0.235*	2.226	0.046
TAC → OR	0.483***	7.529	0.000

Note FOB: focus on beneficiary, SMC: senior management commitment, SPA: staff participation, CIM: continuous improvement, TAD: training and development, OR: organizational reputation

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$

on beneficiary ($\beta = 0.083$, $t = 1.750$, $p = 0.081$). Moreover, the results indicated that the highest impact was for staff participation ($\beta = 0.561$, $t = 9.364$, $p = 0.000$), followed by training and development ($\beta = 0.483$, $t = 7.529$, $p = 0.000$), then senior management commitment ($\beta = 0.311$, $t = 3.297$, $p = 0.017$), and finally the lowest impact was for continuous improvement ($\beta = 0.235$, $t = 2.226$, $p = 0.046$).

6 Discussion

The results showed that there is a positive and strong correlation between the TQM sub-variables and the organizational reputation variable, and that there is a statistically significant effect of TQM on the organizational reputation of Jordanian public universities, as it turns out that TQM was able to explain (25.1%) of the Variation in organizational reputation. This reflects universities' awareness and appreciation for the interest in applying the standards and practices of total quality to raise their performance, which will reflect on their reputation and raise their value. This is confirmed by a study (Obeid et al., 2021), which indicated the interest of the University of Jordan as one of the official universities in the application of total quality management, which contributed to raising the performance of its employees. As well as the study of Rabaa'a & Hamadat (2020), the result of which was that Jordanian private universities also implement total quality management at a high level.

The results showed that Jordanian public universities show great interest in their application of total quality management, but their interest is evident in some practices and not others. There is also a noticeable interest among Jordanian public universities with the participation of individuals in supporting the application of the practices of total quality, which is reflected positively on their overall performance. The findings also revealed that universities place a high value on subjecting faculty members to training courses that help them improve their academic performance, as well as providing financial support in the form of (financial rewards) to increase their research and scientific activity, which reflects the positive impact on faculty members' reputations at these institutions.

7 Recommendations

Based on the results of the study, researchers recommend managers and decision-makers in public universities to pay attention to the university management standard (higher leadership), which has the largest role in supporting and activating the application of total quality management, as the instability of administrative leaders and the inappropriateness of their scientific and administrative qualifications has an influential role on the level of management weakness. And activating the role of the accreditation and quality centers and supporting them with all the needs of qualified financial and human resources, which help them in achieving the effectiveness of

the application of total quality management and conducting a periodic audit for the purposes of continuous improvement. The study also recommends activating the role of liaison officers in the centers, units and colleges of universities with the Accreditation and Quality Center more and supporting it from the technical and training aspects to make a periodic inspection for the purposes of showing weaknesses and shortcomings in the practices of total quality management.

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The Impact of Work-Life Balance on Organizational Commitment

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Abstract The study aimed to explore the effect of work-life balance on the dimensions of organizational commitment (affective, continuance, and normative commitment) by collecting data by means of a questionnaire distributed to a sample of workers in one of the big food companies. The results showed a positive significant

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_65

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effect of work-life balance on the affective and normative commitment, and a negative effect of work-life balance on continuance commitment. These results agreed with some previous studies and differed with others. The study recommended the need to pay more attention to the balance of work because it improves employee emotional attachment and obligation to the organization and reduces their assessment of their relationship with the organization through the costs they incur in the case of leaving the organization. Researchers are recommended to study work-life balance by focusing on its dimensions and not as a whole variable.

Keywords Work-life balance · Affective commitment · Continuance commitment · And normative commitment · Food industry

1 Introduction

Work-life balance (WLB) is of interest to researchers and organizations because of its impact on the level of organizational commitment of employees. It was found that this concept means providing a suitable work environment that balances the activities of work life and the activities of family life. One of the most important effects of WLB is that it leads to reducing employee intention to leave (Agha et al., 2021; Allen & Meyer, 1990) and improving organizational commitment (Alketbi et al., 2020; Wardana et al., 2020). In particular, a higher level of WLB improves employee emotional and normative adherence (Al Kurdi et al., 2020; Khalid & Ibrahim, 2018), and lowers the level of continuance commitment (Alameeri et al., 2020; Dávila, 2019; Shabir & Gani, 2020). Nevertheless, the results reached by the researchers are mixed due to the different samples or sectors that were covered or countries, so the current study was conducted to provide an applied addition and contribute to the generalization of the previous results.

2 Literature Review and Research Hypotheses

2.1 Work-Life Balance

WLB has been defined in several ways. First, WLB is a state of simultaneous satisfaction with work and life (Clark, 2000). Second, WLB is a situation of conflict absence between work and non-work requirements (Kim, 2014). Third, WLB is a case of resources adequacy by which an employee is able to participate in both work and family life in an effective manner (Voydanoff, 2005). Fourth, WLB refers to a

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situation in which time is split between work and personal life resting on priorities (Rigby & O'Brien-Smith, 2010). Fifth, WLB is a state between employee satisfaction and employee organizational commitment (AlShehhi et al., 2020; Peng, 2018). In fact, WLB is divided into three major types: time balance, content balance, and commitment balance. The first type refers to using time to the life and work equally. The second one means that refers to an individual pleasure in both work and life. Finally, commitment balance signifies showing psychological commitment to the roles at the same degree (Tayfun & Çatir, 2014). WLB can be explained using five models: the segmentation model, the spillover model, the compensation model, the instrumental model, and the conflict model. The segmentation model assumes that work life is different from non-work life since both of them represent life-separated aspects, while the spillover model advocates that one of these aspects have a positive or negative influence on the other one. The compensation model hypothesized that one may present what the other does not offer, whereas the instrumental model proposes that the activities of one lead to success in the other, and the conflict model assumes that these two domains conflict due to the high requirements for each of them (Alsuwaidi et al., 2020; Guest, 2002).

2.2 Organizational Commitment

From Allen and Meyer's (1990) view of point, OC is a psychological statethat associate an employee to an organization and therefore reduce his or her turnover intention. Hence, the concept was deemed as a multidimensional construct used to evaluate employee attitudes toward two key work-related aspects, which are employee membership willingness and employee inclination for organizational goals (Al-Hawary & Alajmi, 2017; Al-Hawary & Mohammed, 2017; Alhalalmeh et al., 2020; Mohammad et al., 2020; Meyer & Herscovitch, 2001). Based on such a definition, OC was introduced as an employee attachment with an organization as presented by employee intention to stay and employee extra effort to achieve organizational goals (Meyer et al., 2002; Al Shebli et al., 2021). According to Meyer and Allen, commitment to an organization reflects employee need, desire and obligation to maintain his or her membership in that organization. Therefore, OC has been conceptualized in terms of three dimensions: affective commitment, continuance commitment, and normative commitment (Allen & Meyer, 1990; Allozi et al., 2022). First, affective commitment is a state of positive work-related behaviors such as organizational citizenship behavior (Alshurideh et al., 2015; Meyer et al., 2002). It represents employee wish to stay with an organization due to personally perceived causes such as goal congruence, which a state in which an employee tries to link his personal goals with an organization's goals (Al-bawaia et al., 2022). For Dávila (2019), affective commitment represents employee emotional attachment, identification, and involvement in the organization. Such a dimension can be assessed using numerous statement s such as the one formulated by Marmol (2019), which was "I would be very happy to spend the rest of my career with this [organization]" (P. 115). Second, continuance

commitment occurs when an employee remains with an organization due to a key reason, which is the need that tied the employee to the organization. In such a situation, the employee is aware of the costs of leaving the organization (Alshurideh, 2016; Dávila, 2019). In this regard, a need emerges based on the lack alternatives, leaving-associated costs, or in ability to transfer skills to a different organization (Meyer et al, 2002; Alkitbi et al., 2020). It is a result of a comparison between gains and losses in case of work leave (Alsharari & Alshurideh, 2020; Tayfun & Çatir, 2014). In other words, it is the cost incurred by the individual if he decides to leave the organization (Alshamsi et al., 2020; Koyuncu & Demirhan, 2021). An example of the items used to gauge continuance commitment is "It would be very hard for me to leave my [organization] right now, even if I wanted to" (Marmol, 2019, P. 115). Third, in Meyer and Allen's (1997) words, normative commitment refers to an employee obligation to continue employment. Likewise, Dávila (2019) defined normative commitment as employee feeling of obligation to carry on his or her work in the organization. It refers to the individual's sense of moral responsibility towards the organization (Alshurideh, 2022; Alshurideh et al., 2016; Koyuncu & Demirhan, 2021). Examples of the items that can be used to assess normative commitment include "One of the major reasons I continue to work for this [organization] is that I believe that loyalty is important and therefore feel a moral obligation to remain" (Marmol, 2019, P. 115). In short, it can be said that the emotional attachment to the organization is the reason behind the affective commitment, while the continuance commitment is related to the costs, and therefore its cause is the necessity that necessitates staying in the organization. The reason behind the normative commitment is the sense of responsibility towards the organization.

2.3 WLB and Affective Commitment

Many previous works on the effect of WLB on affective commitment revealed that WLB has a significant positive effect on affective commitment. Investigating such an effect using a sample encompassed of nurses, Tayfun and Çatir (2014) confirmed that WLB exerted a positive influence on affective commitment. Similarly, Shabir and Gani (2020) showed a significant positive relationship between WLB and affective commitment. Gathering data from Korean workers, Kim (2014) showed a positive association between WLB and affective commitment, which in turn affects employee in-role performance. On the other hand, the results of Al Momani (2017) indicated that WLB is negatively associated to affective commitment. Dávila (2019) studied the relationship between WLB practices and OC among academics at a Chilean university and established a positive bond between WLB in terms of family integration practices and affective commitment. Based on these results, the following hypothesis was presumed:

H1: There is a significant relationship between WLB and affective commitment.

2.4 WLB and Continuance Commitment

Generally, the effect of WLB on OC is well documented in the literature (Hariniet al., 2019; Malone, 2010; Sakthivel & Jayakrishnan, 2012; Wardana et al., 2020). However, prior works on the effect of WLB and continuance commitment showed different results. Khalid and Ibrahim (2018) tested the relationship between WLB and OC of radio journalists in Nigeria and concluded that WLB is a significant predictor of continuance commitment. Al Momani (2017) examined the mediating part of OC in the linkage between WLB and employee intention to leave using a sample consisted of women employees from a state hospital in Jordan and found that WLB had no significant effect on continuance commitment. Tayfun and Çatir (2014) examined the relationship between WLB and OC using a sample of nurses in Turkey and found that WLB had no significant effect on continuance commitment. Furthermore, Shabir and Gani (2020) investigated the relationship between WLB and OC among women employees in healthcare industry in India and found that WLB had a negative linkage with continuance commitment. For Dávila (2019), WBL, i.e., economic support and permissions for family responsibilities, is significantly related to continuance commitment. In order to explore the effect of WLB on continuance commitment using the current data, the following hypothesis was introduced:

H2: There is a significant relationship between WLB and continuance commitment.

2.5 WLB and Normative Commitment

For many scholars, WLB is positively related to normative commitment. Examples of previous studies in this regard include Shabir and Gani (2020) who investigated such a relationship in healthcare sector in India, as well as Tayfun and Çatir (2014) who used a sample of nurses working in a state hospital in Turkey. Explicitly, Dávila (2019) pointed out a significant positive relationship between WLB in terms of family integration and normative commitment. In their study on WLB and OC of radio journalists in Nigeria, Khalid and Ibrahim (2018) found a significant relationship between WLB and normative commitment. However, a study carried out by Al Momani (2017) on the mediating role of OC on the effect of WLB on employee intention to leave showed that WLB had a significant negative effect on normative commitment. Consequently, the following hypothesis was postulated:

H3: There is a significant relationship between WLB and normative commitment.

3 Research Methodology

3.1 Research Sample and Data Collection

The population of the study consisted of full-employment male and female employees in one large service company in food industry. Data were collected using a questionnaire administered to a randomly selected sample encompassed 250 employees, 173 questionnaires were returned, from which 11 were excluded due to incomplete responses. Therefore, the final number of the questionnaires used for data analysis purpose were 162 questionnaires.

3.2 Research Instrument

The questionnaire contains 20 items anchored using a five-pint Liker scale, in which 1 refers to strongly disagree and 5 signifies strongly agree. Employees were asked to report their agreement degree on items related to their assessment of WLB and OC statements. WLB was measured using 5 statements adopted from Marmol (2019, P. 115). Those statements were related to workload, work efficiency, family relationships, personal and self-care being, and personal wellness. OC dimensions are measured using 15 items distributed equally on affective commitment (5 items), continuance commitment (5 items), and normative commitment (5 items). These items were adapted from Dávila (2019, P. 18) who carried out a study on the relationship between WLB practices and OC among university academics, therefore, the item were reworded to suite the organization used in the current study.

3.3 Research Conceptual Model

The conceptual model of the research as shown in Fig. 1 displays the three suggested hypotheses of the research, in which WLB is assumed to exert a significant positive effect on affective commitment (AC) as stated in the first hypothesis (H1). WLB is hypothesized to show a significant positive effect on continuance commitment (CC) as indicated in the second hypothesis (H2). As well, WLB is presumed to display a significant positive effect on normative commitment (NC) as identified in the third hypothesis (H3).

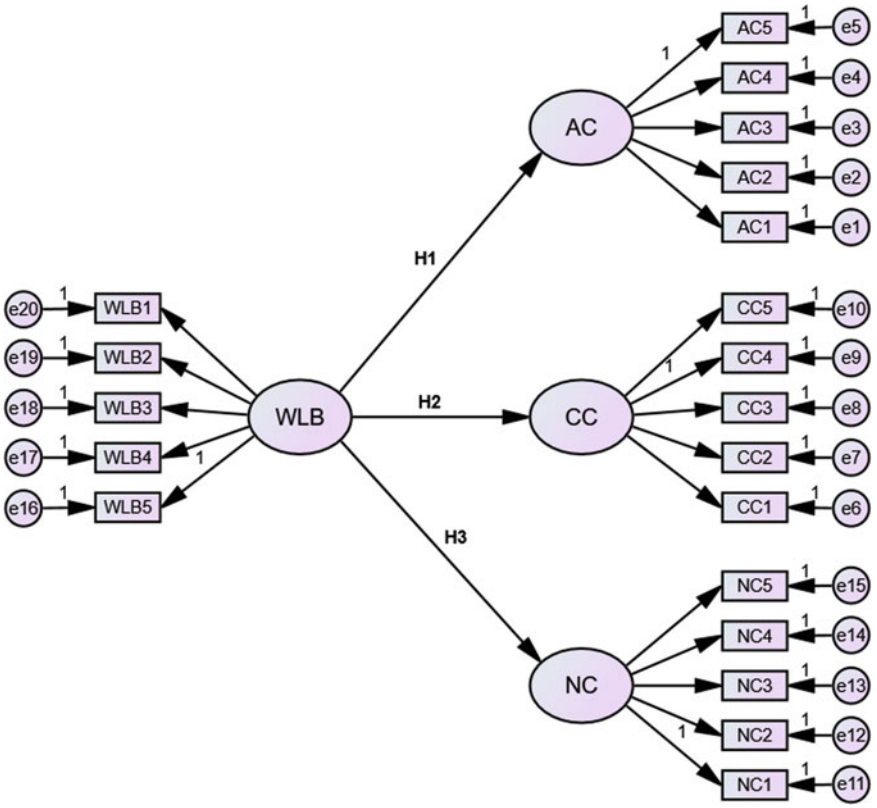

Fig. 1 Research conceptual model

3.4 Multicollinearity, Validity and Reliability

The results of multicollinearity statistics as assessed by variance inflation factor (VIF) and tolerance specify that the current data is free from multicollinearity since VIF values were less than 10and tolerance values were greater than 0.10 (Al-Hawary & Alhajri, 2020; Al-Nady et al., 2013; Altarifi et al., 2015).Exploratory factor analysis (EFA) was carried out first using IBM SPSS 24.0 in order to determine indicator loadings and to test validity in terms of convergent and discriminant values. Convergent validity was evaluated by the average variance extracted (AVE). Its value should be more than 0.50 (Al- Quran et al., 2020; Al-Hawary et al., 2020; AlTaweel & Al-Hawary, 2021), discriminant validity was evaluated using the square root of AVE values. Its value should be upper than the values of the correlation coefficients between any pair of the independent variables. The results in Table 1 show acceptable values of both convergent and discriminant validity. On the other hand, reliability was tested using Cronbach's alpha with a cut-off value of 0.70 (Mohammad et al., 2020), in addition to McDonald's Omega (ω) with a similar threshold value of 0.70

Table 1 Results of validity and reliability

Components	Items	Factor loadings	Validity		Reliability		
			AVE	√AVE	CR	α	ω
Affective Commitment (AC)	AC1	0.789	0.687	0.829	0.916	0.893	0.892
	AC2	0.811					
	AC3	0.833					
	AC4	0.824					
	AC4	0.884					
Continuance Commitment (CC)	CC1	0.842	0.707	0.841	0.923	0.931	0.929
	CC2	0.810					
	CC3	0.832					
	CC4	0.852					
	CC5	0.867					
Normative Commitment (NC)	NC1	0.818	0.629	0.793	0.894	0.843	0.836
	NC2	0.832					
	NC3	0.802					
	NC4	0.768					
	NC5	0.741					
WLB	WLB1	0.982	0.743	0.862	0.935	0.927	0.918
	WLB2	0.891					
	WLB3	0.731					
	WLB4	0.803					
	WLB5	0.883					

(Al-Hawary & Al-Syasneh, 2020)and composite reliability (CR) with a value greater than 0.70 (Mohammad, 2017; Al-Lozi et al., 2018; Al-Hawary & Obiadat, 2021). The results in Table 1 involve satisfactory values of reliability indexes. CR values ranged from 0.894 to 0.935, Cronbach's alpha coefficients ranged between 0.843 and 0.929, while McDonald's Omega values were from 0.836 to 0.929. Overall, both validity and reliability were assured.

3.5 Descriptive Statistics and Correlation Matrix

Means (M) and standard deviations (SD) were used to describe the degrees of research variables. It can be noted from Table 2 that the degrees of affective commitment, continuance commitment is moderate, and normative commitment were moderate ($M = 3.56$, $SD = 0.841$, $M = 2.89$, $SD = 0.792$, $M = 2.95$, $SD = 0.852$ respectively). The degree of WLB was also moderate ($M = 3.48$, $SD = 0.951$). In terms of Pearson correlation coefficients, the results in Table 2 illustrate that the research variables are

Table 2 Descriptive statistics and correlation matrix

Constructs	Mean	SD	(1)	(2)	(3)	(4)
(1)Affective commitment	3.56	0.841	1	–	–	–
(2)Continuance commitment	2.89	0.792	0.441**	1	–	–
(3)Normative commitment	2.95	0.852	0.452**	0.487**	1	–
(4)WLB	3.48	0.951	0.495**	0.396**	0.472**	1

** Correlation is significant at the 0.01 level (2-tailed)

Table 3 Results of model fit

Index	Measurement model	Structural model	Criteria	Result
CMIN/DF	2.381	2.381	<3.00	Accepted
GFI	0.924	0.924	>0.90	Accepted
CFI	0.964	0.964	>0.90	Accepted
RMSEA	0.072	0.072	<0.08	Accepted

significantly correlated, i.e., affective commitment had a significant correlation with both continuance commitment (r = 0.441) and normative commitment (r = 0.452). Affective commitment, continuance commitment, and normative commitment had significant correlations with WLB (r = 0.495, 0.487, 0.396 respectively).

3.6 Model Fit

Chi-square-to-degree of freedom ratio (CMIN/DF), the Goodness of Fit Index (GFI), the Comparative Fit Index (CFI), and the Root Mean Squared Approximation of Error (RMSEA) are used to test model fit. The results in Table 3 asserted that the fit indices of both measurement and structural models are accepted. CMIN/DF = 2.381, GFI = 0.924, CFI = 0.964 and RMSEA = 0.072. CMIN/DF is less than 3, GFI and CFI are greater than 0.90, and RMSEA is less than 0.08 (Al-Lozi et al., 2017; Al-Nady et al., 2016; Alolayyan et al., 2018).

3.7 Hypotheses Testing

Structural equation modeling (SEM) was applied using IBM AMOS 23.0 o test research hypotheses. Figure 2 shows the structural model of the research.

The detailed statistics as publicized in Table 4 indicate that WLB had a significant effect on all OC dimensions, i.e., affective commitment ($\beta = 0.312$, P = 0.000), continuance commitment ($\beta = -0.171$, P = 0.000), and normative commitment

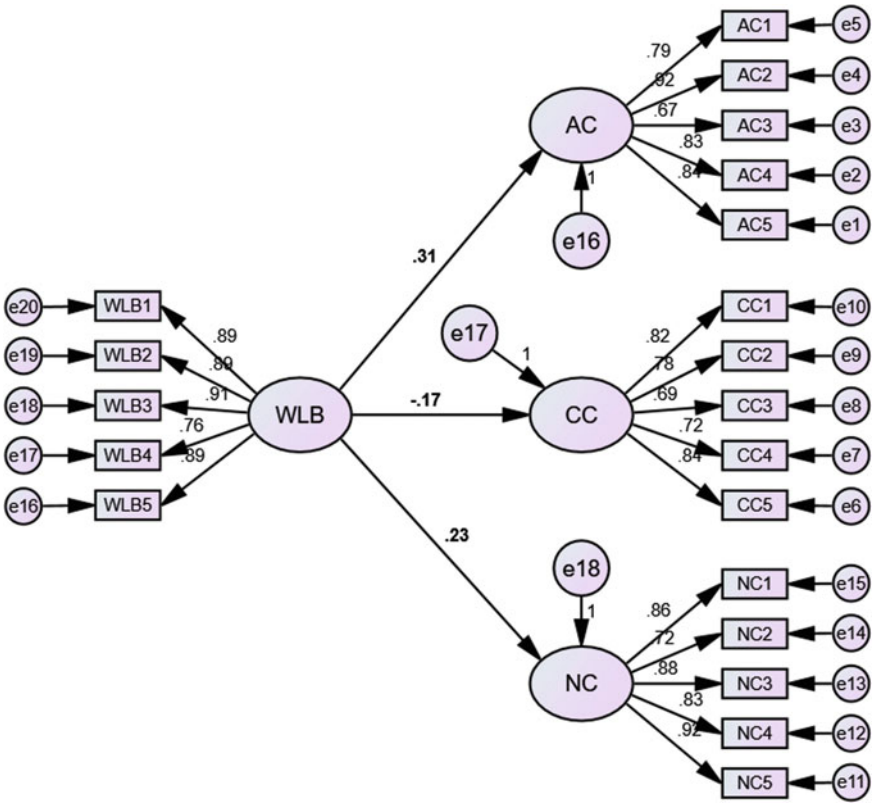

Fig. 2 Research structural model

($\beta = 0.233$, $P = 0.000$). Based on these results, the three research hypotheses were supported, which means that WLB.

Table 4 Results of hypotheses testing

Hypotheses	Paths			β	P
H1	WLB	→	AC	0.312	0.000
H2	WLB	→	CC	−0.171	0.000
H5	WLB	→	NC	0.233	0.00

4 Results and Discussion

The aim of this study was to investigate the effects of work-balance life on organizational commitment dimensions (i.e., affective commitment, continuance commitment, and normative commitment. Hence, three hypotheses were suggested. The first hypothesis assumed that WLB has a significant effect on affective commitment (H1); the second hypothesis postulated that WLB has a significant effect on continuance commitment (H2), and the third one suggested that WLB exerted a significant effect on normative commitment (H3). All these hypotheses were supported by the current data. In terms of the directions of the effects, the results showed that WLB had positive effects on affective commitment and normative commitment and a negative effect on continuance commitment. In comparison with previous works, it was noted that the first result, i.e., the significant positive effect of WLB, was echoed by Tayfun and Çatir (2014). Moreover, the second result, i.e., the significant negative effect of WLB, was found by Shabir and Gani (2020). Finally, in line with the current third result, some previous studies (e.g., Dávila, 2019) pointed out that WLB had a significant positive effect on normative commitment. In fact, these results can be explained based on the nature of each dimension of OC construct. That is, the differences between these dimensions is the reason behind these results. Emotional encourages of the individual to continue in the organization because he/she feels happy. In the case of continuance commitment, the criterion for the employee to remain in the organization is the costs incurred by him/her if he/she leaves the organization. WLB also helps to improve normative commitment because the employee feels responsible for the organization.

5 Research Conclusion and Recommendations

The study concluded the importance of WLB in improving the level of organizational commitment of the employee, and therefore organizations must focus on the other side of the employee's life, which is the personal life and providing the appropriate organizational climate that does not make the employee obliged to stay in the organization because there is no other alternative.

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The Influence of Enterprise Risk Management Framework Towards Company Performance at Conglomerate Group of Companies

Azman Makmor, Nurhanan Syafiah Abdul Razak, Musmuliadi Kamaluding, and Muhammad Alshurideh

Abstract This study explores the influence of Enterprise Risk Management (ERM) framework implementation on the company performance at a conglomerate group of companies, DRB-HICOM Berhad (the Group). This study intends to solve the problem in assessing the relationship between company performance and ERM implementation by focusing on the companies that standardized their ERM implementation towards all subsidiary companies with multi-type of businesses. In this theoretical analysis, quantitative research with correlational research design will be used, and sampling analysis will be done based on the data samples from 3 main business sectors (namely automotive, properties and services) in the Group and both primary and secondary data from Group subsidiary companies. The evaluation on the adoption of the Committee of Sponsoring Organization of the Treadway Commission (COSO) ERM framework within the subsidiary companies will be a key in assessing the ERM practices within the Group. At the same time, the company performance was measured from the company revenue achievement. Different from previous researches done by previous scholars where the studies were only analyzed on one

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_66

type of business (single way of ERM implementation only and without comparison) or were done on multi-type of businesses/companies (where too many ways of ERM implementation) which contributed to the failures in assessing the relationship between companies performance and ERM implementation, this study will provide a new solution on the above shortcomings by analyzing the companies (with different type businesses) that have an identical implementation of ERM framework across the Group. This may help future researchers and ERM practitioners to develop better standardization of ERM implementation based on the COSO framework. This paper also provides an insight into the best practices in the ERM to be implemented in other companies or organizations, which will impact the company in terms of financial and non-financial performances.

Keywords Enterprise Risk Management (ERM) · Company performance · Revenue · The Committee of Sponsoring Organization of the Treadway Commission (COSO)

1 Introduction

In the world of globalization in the 21st century has created a more complex, interdependent, and uncertain world than ever witnessed before. The opportunities and challenges have come together with significant risks to a business organization (Power, 2013). For instance, the well-known financial crisis in 1998 (Asian financial crisis) and 2007 (global financial crisis) led Lehman Brothers, the United States giant investment bank went bankrupt in the year 2008. The situation has continued and spread to other countries in the whole world.

As business opportunities and risks are constantly changing, organizations need to continuously identify, assess, manage, and monitor their business opportunities and threats (Protiviti, 2006). Effective risk management in the organization can minimize the impact on any crisis events and may create opportunities for the organization to succeed in today's business environment.

Enterprise Risk Management (ERM) is an integrated approach, structured and very systematic tool for management to comprehensively manage, evaluate and mitigate all the risks in the organization to successfully achieve the organization's objective (Dickinson, 2001). Exemplary ERM implementation will benefit the company in financial impact as company performance.

Many kinds of research tried to study, investigate, and examine the relationship between ERM implementation impacts the company's performance. However, due to a lack of reliable and standard methods, most of the studies failed to address the influence of ERM framework towards company's performance. The relation between company performances with ERM has still not been resolved and needs further study to be done in this field by scholars and researchers (Mikes & Kaplan, 2013; Fraser & Schoening-Thiessen, 2010).

In previous ERM researches, most of the studies are done on a specific type of business or organization, and no research has been done on the group of companies with diversified businesses. Generally, this study aims to envisage the influence of the ERM framework on company performance in a conglomerate group of companies with diversified businesses.

Diversifying the business will offering a lot of advantages and opportunities to the group of companies. It will offer a better choice to customers, build trust in the services or products offered, create a new potential range in an additional stream of revenue, and most important is it could spread the business risks among the companies in the group (Raymond, 2016). This also is well known as a conglomerate group of companies. Merriam-webster has defined 'conglomerate' as 'A widely diversified corporate' (Merriam-webster, 2020).

2 Background of the Study

This study is conducted in one of Malaysia's largest and most diverse conglomerates, DRB-HICOM Berhad ("DRB-HICOM" or the "Group"). As a conglomerate group of companies, DRB-HICOM involves many business sectors such as automotive, services, properties, hospitality, and education. Despite having a good business reputation in the country, running a diversified business requires the Group to cautiously manage their risks as an overextension of company resources, lack of expertise, high operation cost, and reduced innovation are the challenges DRB-HICOM must face in sustaining their businesses.

As a corporate practice in the Group, all the CEOs or Head of Companies will prepare their organization Annual Management Plan (AMP), containing company business objectives and strategic plans to sustain and grow the business. The AMP will be presented and to be approved by the Group General Managing Director (GMD). The performance of the AMPs will be monitored by various Board Committees and Senior Management members in the Group, namely Board Audit Committee (BAC), Board Nomination and Remuneration Committee (BNRC), and Board Risk and Sustainability Committee (BRSC).

The responsibilities in identifying principal risks and ensuring the implementation of an appropriate system to manage these risks are delegated to the Board Risk and Sustainability Committee (BRSC), supported by the Group Risk Management Committee and chaired by GMD (Group CG Report, 2019). To ensure the risk management is well-practiced within the Group, COSO ERM Framework and ISO 3100 are two primary standards that being references to the Group.

In Malaysia, Risk Management (RM) is governed through corporate governance, which set out from essential requirements which are coming from Bank Negara Corporate Governance (BNCG) policy, Malaysia Companies Act 2016, Malaysia Code of Corporate Governance (MCCG) 2017 by Securities Commission of Malaysia and Bursa Securities Main Market Listing Requirement (MMLR) by Bursa Malaysia.

Most of the companies in Malaysia are only complying with the requirements without gauging the effectiveness of the ERM implementation in their organizations. Even though they believe there is a good impact from the ERM implementation in their organization. Still, due to the non-existence of reliable method to determine the ERM effectiveness and performance, most organizations do not care about how they manage their risks as long as the implementation meets the requirements (Kraus & Lehner, 2012).

In response to this problem, the study envisage how the eight elements in the ERM framework established by COSO may affect company performance at the conglomerate group of companies.

3 Literature Review

In the past few decades, many researchers are being published by academic researchers and practitioners in conducting studies of characteristics and the implementation of ERM (Fraser & Simkins, 2010). In determining the focus and scope of this study, previous major studies on ERM have been studied to develop a group of study streams. Based on the previous 19 major studies on ERM, the studies stream has been categorized into four categories, as shown in Fig. 1.

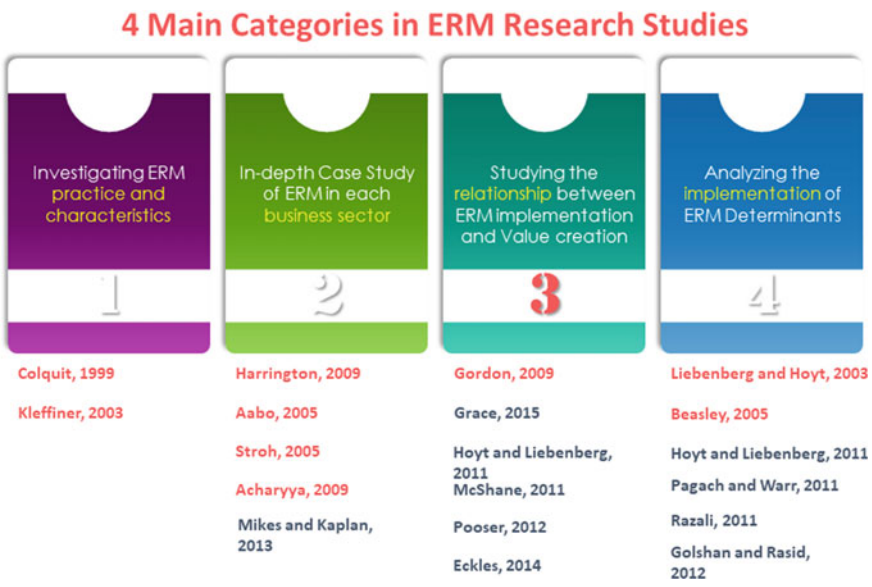

Fig. 1 Table of ERM main study streams

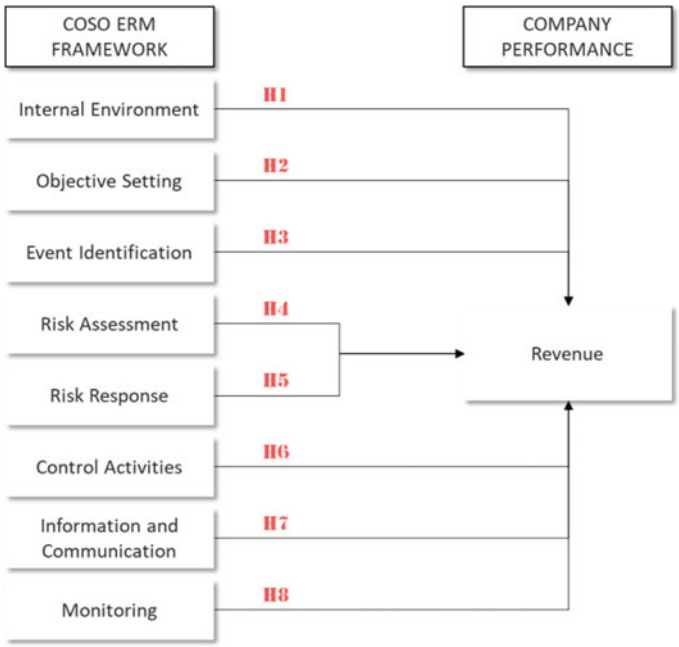

Fig. 2 Research conceptual framework

As shown in Fig. 1 above, the first category of ERM studies is the studies investigating ERM practice and characteristics (namely Colquit et al., 1999; Kleffner et al., 2003).

The second category is the studies making in-depth ERM case studies on specific business sectors (namely Aabo et al., 2005; Acharyya, 2009; Harrington et al., 2009; Mikes, 2009; Stroh, 2005).

The third category is the studies examining the relationship between ERM implementation and value creation (Gordon et al., 2009; McShane et al., 2011; Hoyt & Liebenberg, 2011; Pooser, 2012; Eckles et al., 2014; Grace et al., 2015).

Lastly, the fourth category is the studies that are analyzing the implementation of ERM determinants only (namely Beasley et al., 2005; Golshan & Rasid, 2012; Hoyt & Liebenberg, 2011; Liebenberg & Hoyt, 2003; Pagach & Warr, 2011; Razali et al., 2011).

Based on Fig. 1 above, the focus and scope of this study are under category three, which examining the relationship between ERM implementation and value creation (e.g., company performance). In-depth searching on the research that falls under this category has been done, and there are 34 kinds of research that have a similarity with this study's topics.

Further, post examining the research titles, theories, and methodologies, five kinds of research are found with close similarity with this study. Table 1 summarizes the

prominent writers and sources selection process (e.g., Teoh & Rajendran, 2015; Kashif & Fong, 2018; Ryan, 2013; Kingsley, 2017; Husam, 2017).

3.1 Research Gap Analysis

Based on the above, five prominent writers and their researches have been identified as primary sources to this study due to the similarity in the title, dependent variables, independent variables, theories, and methodologies applied in their studies.

To identify the central issues in this study, the bridges between previous topics in the primary sources need to be built. They need to be criticized as this could help in identifying the gap between previous scholarly works. The critics are tabled as per Table 2. The critics are mainly on the inconsistent and unreliable company performance measurement variables where only Return of Equity (ROE) or Return of Asset (ROA) are only being used to measure company performance.

3.2 Company Performance

Company performance which is also defined as business performance is part of an organization's effectiveness. In this 21st century, company performance is focused on how organizations fully utilize their resources to improve their capabilities and abilities in achieving their objectives (Taouab & Issor, 2019; Alshurideh et al., 2020; Alshurideh et al., 2021; Alzoubi et al., 2021; Kabrilyants et al., 2021; Tariq et al., 2022).

As one of the essential management tools for improving business performance, ERM practices also help reduce different types of risk exposure to the business (Yang & Ishtiaq, 2018). A company with established ERM practices typically enjoys high operational performance and high revenue compared to a company with a lack of ERM practices (Callahan & Soileau, 2017). It is not doubted that there is a significant positive association between ERM practices and company business performance (Callahan & Soileau, 2017; Florio & Leoni, 2017; Zou & Hassan, 2017).

Based on the research gap analysis in 3.1, to have a good measurement of company performance, it is essential to measure both ***Financial Market Measurement*** (Market valuation-Tobin's Q) and ***Business Measurement*** (Revenue, Gross Profit, GP, Profit Before Tax, PBT, and growth rate) and accounting measurement (Return on Assets, ROA, and Return on Equity, ROE). The description of each element are described as below.

i. **Market Valuation (Tobin's Q):** (Q ratio or Tobin's Q) equals the market value of a company divided by its assets' replacement cost.
ii. **Revenue:** Units Sold x Sales Price.
iii. **Gross Profit (GP)**: Revenue—Cost of Goods Sold.

Table 1 Main writers and sources

ERM study stream category 3: studying the relationship between ERM framework and company performance (value)	Title	Theory	Methodology (Quantitative)
Sajjad and Engku (2017)		x	x
Kashif and Fong (2015)			x
Stephen et al. (2013)		x	x
Teoh and Rajendran (2015)	**x**	**x**	**x**
Kashif and Fong (2018)	**x**	**x**	**x**
Carolyn and Jared (2017)	x		x
Ryan (2013)	**x**	**x**	**x**
Kingsley (2017)	**x**	**x**	**x**
Tseng (2007)	x		x
Gordon et al. (2009)	x		x
Luis et al. (2020)	x		x
Rasid et al. (2012)	x		x
Musa et al. (2014)	x		x
Farah and Muneera (2017)	x	x	
Cristina and Giulia (2016)			x
Tahira and Faisal (2019)			x
Shoki (2019)	x	x	
Idris and Norlida (2016)	x		
Mohammad et al. (2019)	x		x
Yinka et al. (2018)	x		x
Tony et al. (2012)	x		
Alaa and Mukhtar (2017)	x		x
Pravaneh (2020)	x		x
Gullanut and Nopadol (2015)		x	
Izah and Ahmad (2011)	x		
Husam (2017)	**x**	**x**	**x**
Phillip and Nadine (2017)			x
Desender and Lafuente (2009)		x	
Kommunuri et al. (2009)	x		x
Ali et al. (2019)	x		x
Kuranaratne (2017)	x	x	x
Opiyo (2012)	x		
Annamalah et al. (2013)	x		x
Ramlee and Ahmad (2015)	x		x

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Table 2 Critics on previous scholar works

Authors	Title	DV	IV	Scopes	Study results	Critics
Teoh and Rajendran (2015)	The impact of ERM of Firm Performance: Evidence from Malaysia	Company performance (Financial and Non-financial)	COSO ERM implementation Company size Company complexity BODs monitoring	Bursa Malaysia PLC Companies	Prove the significant relationship of ERM implementation and firm performance of PLCs in Malaysia	Low response rate (13.38%). Good DV with covering on Financial and Non-Financial
Kashif and Fong (2018)	ERM implementation and Firm Performance: Evidence from the Malaysia Oil and Gas Industry	Company performance (Return on Asset—ROA)	1.Internal environment 2.Objective setting 3.Event identification 4.Risk assessment 5.Risk response 6.Control activities 7.Information & communication 8.Monitoring	Oil and Gas listed companies in Bursa Malaysia	Found ERM implementation has a positive effect on the firm performance	Not reliable DV. Only ROA as DV

(continued)

Table 2 (continued)

Authors	Title	DV	IV	Scopes	Study results	Critics
Ryan (2013)	An empirical investigation into the association between ERM and Firm Financial Performance	Financial performance (KPI)	1.COSO ERM adoption 2.ERM maturity 3.Firm-specific variables	Listed companies	Found COSO and ERM implementation have a positive effect on the firm performance	Not reliable DV. Only ROA as DV
Kingsley (2018)	The impact of ERM and Firm Performance: Evidence from Sri Lankan banking and finance industry	Company performance (Return on Equity – ROE)	Same as above (8 components in COSO ERM Framework)	Sri Lanka finance and banking listed companies	Found COSO ERM framework adoption has an impact on the firm's performance	Not reliable DV. Only ROE as DV
Husam (2017)	COSO ERM implementation in Jordanian commercial banks and its impact on Financial Performance	Financial performance (ROA, ROE, D/E, CAR, NPL)	Same as above (8 components in COSO ERM Framework)	Jordan Commercial banks	Concluded the COSO ERM implementation is maintaining a high level of execution	Not reliable DV. Only ROA as DV

iv. **Profit Before Tax (PBT)**: Computed by getting the total sales revenue and then subtracting the cost of goods sold, operating expenses, and interest expense.
v. **Growth Rate**: (Current total revenue—Last year total revenue)/Last year total revenue
vi. **Return on Equity (ROE)**: Calculated by dividing net income by shareholders' equity. ROE is considered the return on net assets.
vii. **Return on Asset (ROA)**: Calculated by dividing net income by average total assets. ROA shows how much profit a company can generate from its assets.

This study is proposing for all these elements to be measured as company performance. Not all types of businesses are operating with the same business model, where the best measurements to measure their performances are different depending on their business model or type of business. Thus, incorporating all these elements like a company performance will produce higher accuracy in measuring company performance achievement.

However, due to the limitation of research time constraint, this study will only discuss the revenue as a measurement for the company performance, as in the DRB-HICOM Group, revenue is the most anticipated figure by the management as a company performance indicator in this diversified business of a conglomerate group of companies.

3.3 ERM Framework Components

One of the biggest problems and difficulties in implementing the ERM framework in an organization is that there are many definitions and practice standards in ERM (Aven, 2012). In this study, the COSO ERM framework is chosen as the independent variable. COSO ERM Framework is the most accepted and practiced ERM framework by organizations (Perera, 2019). There are eight components in the COSO ERM framework, which are explained as per below:

3.3.1 Internal Environment

The internal environment influences the establishment of company strategies and objectives (Al Mehrez et al., 2020; Alshurideh, 2019; ELSamen & Alshurideh, 2012). Consideration of the internal environment is essential in determining risk appetite and integrating ERM with related initiatives. ERM's supportive internal environment is a fundamental requirement for successfully implementing an effective ERM system in an organization. The internal environment represents the "tone of the top management" that encompasses the management attitude and awareness about the importance and the relevance of the ERM towards creating and preserving the company's value. The integrated framework's internal environment represents the organization's tone, including the risk management philosophy and risk appetite.

According to Kinyua et al. (2015), they recognize a significant association between internal control environment and financial performance. According to Liebenberg and Hoyt (2003), in one of their articles on "The determinants of enterprise risk management: evidence of the appointment of chief risk officers" states that this context, it is believed that ERM supportive internal environment facilities a culture of risk aligned decision making that would positively affect the company performance.

3.3.2 Objective Setting

Selects a strategy that is utilized throughout the enterprise and aligned with and linked to the strategy (Alaali et al., 2021; Ashal et al., 2021). The point when management sets its objectives is the point they set their risk. Management needs to develop their objectives by considering the corresponding risk of achieving them. According to Gates et al. (2012), most ERM frameworks assert that risk should be identified concerning the company objectives. As per the COSOs ERM integrated framework (2014), company objectives should be aligned within the company's risk appetite and risk tolerance levels. The company engaged in ERM should better understand the aggregated risk of different business activities, providing them with a more objective basis for resource allocation that will improve return on equity (ROE) and capital efficiency (Eikenhout, 2015). According to Hoyt and Liebenberg (2011), ERM strategy aims to reduce volatility by preventing aggregation of risk across different sources. In the DRB-HICOM Group, it's an essential responsibility for the CEO to establish company's long term objectives. When the objective setting and risk are aligned, this will help top management to consider any opportunities and threat in setting the objectives for the company. With different type of businesses in the Group will established a different type and nature of the risk for the companies and definitely the type of objectives also are determined by this factor. Company objective setting is always driven by the estimated revenue that has been set by the DRB-HICOM Group, and these expected revenue is always associated with the risk elements. To this effect, it is the time of the company's objective setting to set its desired risk appetite effectively.

3.3.3 Event Identification

Event identification takes into consideration both internal and external factors that affect event occurrence. By having a consideration on internal and external factors will help companies in the Group to predict any favorable or unfavorable situation that might become a obstacle for the companies to achieve their objectives. This component will stimulate companies to make an early identification and make a proper and suffice preparation to face any events which may impact negatively or positively to the company performance. As such, event identification minimizes the risk of facing business surprises will minimize volatility in return and improve company's financial performance. According to COSO's ERM integrated framework,

it is very important for a companies to identify internal external events that will give an impact towards company in achieving their objectives and the impacts have to be distinguished between the threats and opportunities. The identified opportunities are channeled back into company's objective setting (COSO, 2004). By identifying the events and managing the threat and opportunities, will help companies to set a right strategies to ensure the company's long term objectives.

3.3.4 Risk Assessment

Allows an entity to consider how potential events might affect the achievement of objectives. Risk assessment encompasses assessing the likelihood and impact of events affecting the achievement of a company's objectives. It enables an organization to determine a more approach to address the risk factors emerging from the internal and external environment. Unlike the ISO 31000 standard on ERM (2009), which recognizes only the residual risk, ERM integrated framework assesses the risk on both inherent and residual basis. According to Solomon and Muntean (2012), a company's risk assessment based on leverage coefficients is required for the predicted behavior analysis for estimating future results. According to Deloitte and Touche LLP; Curtis and Currey (2012), Risk assessment is essential since it is how enterprises handle how significant each risk is to the achievement of their overall goals.

3.3.5 Risk Response

Management identifies risk response options and considers their effect on event likelihood and impact concerning risk tolerances and costs versus benefits and implements response options. Based on the risk assessment and in the light of the company's risk tolerance and appetite, management should decide upon the suitable response to each identified risk factor choosing amongst the risk avoidance, risk acceptance, risk-sharing, and risk reduction. An effective risk responding strategy is expected to have a positive impact on the company's performance. According to Vollmer (2015), a cost-effective and efficient risk response plan helps balance risk mitigation with the expected benefits of the strategic program.

3.3.6 Control Activities

Control activities ensure the completeness, accuracy, and validity of the various policies and procedures. Control activities are also designed to address the identified risk factors involves the management's policies and procedures to ensure that risk responses are effectively implemented. Some researchers assert that the effective implementation of control activities enhances operating efficiency and enhances company performance. According to Munene (2013), results established a significant relationship between an internal control system and financial performance.

Eniola and Akinselure (2016) state that effective internal controls will significantly improve financial performance by helping the organization to substantially reduce fraud perpetration. According to Beeler et al. (1999), internal controls provide an independent appraisal of the quality of managerial performance in carrying out assigned responsibilities for better revenue generation. Control activities usually strengthen the company's internal control functions, which enhances the efficiency and effectiveness of the operations affecting the company's performance positively.

3.3.7 Information and Communication

Information and communication are to process and refine large volumes of data into actionable information (Alshurideh et al., 2014; Alyammahi et al., 2020). Effective information communication channel is vital to achieving the intended benefits of an integrated risk management framework. Effective integration can only be achieved by ensuring effective communication among the related functions and people throughout the organization. This is a crucial feature that differentiates ERM from traditional silo-based risk management. The improvement in the organization's risk profile information is another potential source of value created by ERM (Eikenhout, 2015). According to Chaffey and Wood (2005), as cited by Olugbode et al. (2008), decisions tend to be more informed and effective when the communication is thorough and accurate. Enhanced communication of risk information lets the organizational managers make informed and risk-aligned decisions, leading to better performance.

3.3.8 Monitoring

The process of monitoring or assessing both the presence and functioning of the enterprise risk management components and the quality of the performance over time is a key factor in the process.

3.4 Relationship Between ERM Framework and Company Performance

Compared to other studies that have been done on studying the relationship between ERM framework and company performance, this research will provide better and reliable measurement on the study of the influence of ERM framework and company performance as this study will be tested not only on a single type of business but will be tested to many types of organization that exercising the same ERM implementation in their company as they being managed by a single risk management group at the holding company.

The hypothesis of this study is to propose a relationship between COSO ERM Framework (independent variables—control and change) and Company Performance (dependent variable—observes and measures). The description of the relationship between these two variables are constructed as below:

3.4.1 Internal Environment—Revenue

According to Kinyua et al. (2015), they recognize a significant association between internal control environment and financial performance. According to Liebenberg and Hoyt (2003), in one of their articles on "The determinants of enterprise risk management: evidence of the appointment of chief risk officers" states that this context, it is believed that ERM supportive internal environment facilities a culture of risk aligned decision making that would positively affect the company performance. Thus, this study derives its first hypothesis concerning ERM adoption as below:

H1: There is an impact from the internal environment in increasing the revenue at the conglomerate group of companies.

3.4.2 Objective Setting—Revenue

According to Gates et al. (2012), most ERM frameworks assert that risk should be identified concerning the company objectives. According to Hoyt and Liebenberg (2011), ERM strategy aims to reduce volatility by preventing aggregation of risk across different sources. The company engaged in ERM should better understand the aggregated risk of diverse business activities, providing them with a more objective basis for resource allocation that will improve return on equity (ROE) and capital efficiency (Eikenhout, 2015). Thus, this study derives its second hypothesis concerning ERM adoption as below:

H2: There is an impact from objective setting in increasing the revenue at the conglomerate group of companies.

3.4.3 Event Identification—Revenue

According to COSO's ERM integrated framework, the internal and external events affecting a firm's objectives must be identified, distinguishing between risks and opportunities. Opportunities are channeled back to management's strategy or objective-setting process (COSO, 2004). Thus, this study derives its third hypothesis concerning ERM adoption as below:

H3: There is an impact from event identification in increasing the revenue at the conglomerate group of companies.

3.4.4 Risk Assessment—Revenue

According to Solomon and Muntean (2012), a company's risk assessment based on leverage coefficients is required for the predicted behavior analysis for estimating future results. According to Deloitte and Touche LLP; Curtis and Currey (2012), Risk assessment is important since it is how enterprises get a handle on how significant each risk is to the achievement of their overall goals. Thus, this study derives its fourth hypothesis concerning ERM adoption as below:

H4: There is an impact from risk assessment in increasing the revenue at the conglomerate group of companies.

3.4.5 Risk Response—Revenue

According to Vollmer (2015), a cost-effective and efficient risk response plan helps balance risk mitigation with the expected benefits of the strategic program. Thus, this study derives its fifth hypothesis concerning ERM adoption as below:

H5: There is an impact from risk response in increasing the revenue at the conglomerate group of companies.

3.4.6 Control Activities—Revenue

According to Munene (2013), results established a significant relationship between an internal control system and financial performance. Eniola and Akinselure (2016) state that effective internal controls will significantly improve financial performance by helping the organization to significantly reduce fraud perpetration. According to Beeler et al. (1999), internal controls provide an independent appraisal of the quality of managerial performance in carrying out assigned responsibilities for better revenue generation. Thus, this study derives its sixth hypothesis concerning ERM adoption as below:

H6: There is an impact from control activities in increasing the revenue at the conglomerate group of companies.

3.4.7 Information and Communication—Revenue

The improvement in the organization's risk profile information is another potential source of value created by ERM (Eikenhout, 2015). According to Fisher and Kenny (2000), as cited by Olugbode et al. (2008), they suggest that organizations infuse information systems into their operations to enhance competitiveness and facilitate business growth and success. According to Chaffey and Wood (2005), as cited by Olugbode et al. (2008), decisions tend to be more informed and effective when the communication is thorough and accurate. Thus, this study derives its seventh hypothesis concerning ERM adoption as below:

H7: There is an impact from information and communication in increasing the revenue at the conglomerate group of companies.

3.4.8 Monitoring—Revenue

According to Wholey et al. (2010), government monitoring and evaluation are used to increase transparency, strengthen accountability, and improve performance. The monitoring function could be an ongoing process or timely evaluation aiming to decide whether further modifications are required for the company's ERM. Thus, this study derives its eighth hypothesis concerning ERM adoption as below:

H8: There is an impact from monitoring in increasing the revenue at the conglomerate group of companies.

4 Research Conceptual Framework

Research Underpinning Theory—The Theory of Business Performance Measurement

Business performance measurement could be measured from 3 functional analyses, such as an accounting perspective, marketing perspective, and operations perspective (Neely, 2002). These three perspectives are derived from the theories and concepts underpinning the field of business performance measurement. The theory of 'Risk in performance measurement' from Andrew Likierman has highlighted that risk management is an essential tool that needs to be integrated into business management (Likierman, 2007).

The research framework for this study is developed based on the gap found in previous literature. As explained in 2.6.2, there is a need to further the analysis in determining the influence of the ERM framework on company performance by incorporating reliable indicators to measure the relationship between the ERM framework and company performance.

From this study, it is expected to find the key determinants in the ERM framework that will impact company performance. A conceptual framework below illustrating the expectations to find through this research and also mapping out the relations between ERM framework determinants (Independent Variables) and company performance (Dependent Variables):

5 Research Methodology

The issues in this study will be studied and analyzed by adapting the quantitative research strategy. The research questions also will be addressed by using the quantitative research strategy. By using this research strategy, all the data are gathered and compiled from a survey questionnaire in analyzing the implementation and execution of the ERM framework in the Group subsidiaries.

This research target population for the survey is the whole population of a group of companies under DRB-HICOM Berhad (subsidiary companies). This is to allow to understand the current of ERM implementation ERM in the Group. Samples are clustered based on the type of business (business sectors) of the subsidiary companies. Cluster sampling design is used, and no stratification involves in population sampling.

The sampling unit for this study research is the number of subsidiary companies selected and available as a study sample. The sampling size for this study is the number of companies in DRB-HICOM Berhad (Group) that implemented ERM and practicing the same standard as per Group guidelines, which are around 40 to 45 companies. Due to this study is aiming to seek a practical ERM component to be used in performance measurement and recognize the current state of risk management in a conglomerate group of companies, it is utmost essential to obtain a survey feedback from an expert or person who is managing and governing the process of risk management within a subsidiary companies in the Group. The surveys are disseminate to all CEOs, Chief Risk Officer (CRO), Chief Financial Officer (CFO), or Risk Manager, Risk Management Committee members across the subsidiary companies in the Group.

On the statistical analysis method, descriptive statistics, cluster analysis, and factor analysis are the analysis methods that will be used in this study. Descriptive statistics are used in this research in describing the basic features of the collected data. This method provides a summary of the sample and the measures. Using this method helps simplify large amounts of data sensibly as each descriptive statistic reduces a lot of data into a more straightforward summary (Trochim, 2007). Cluster analysis is used in this study to analyze the influence of ERM implementation from different business sectors in the Group. Principal Component Analysis (PCA) is used to reduce the number of variables to components and use the principal component regression score. In this study, Partial Least Square (PLS) Regression is used to extracting latent factors when there remains factor variation in modeling, which is sometimes called a projection to latent structure that is still unobserved in structural equation modeling (Rannar et al., 1994).

In this research, Data Processing, the SPSS program has been identified to analyze the collected data and information. The original name for this software was Statistical Package for the Social Science (Quintero, 2012). For the current version (post-2015), the version name was changed to Statistical Product and Service Solutions (Hejase and Hejase, 2013). For Cluster Analysis, SPSS offers three methods, namely K-Mean Cluster, Hierarchical Cluster, and Two-Step Cluster. SPSS also be used for

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both Factor Analysis, i.e., Principal Component Analysis (PCA) and Partial Least Square (PLS) Regression.

Based on the regression model's data, it will be used to determine the relationship and influence of the ERM framework towards company performance.

6 Study Conclusion

By implementing risk management in an organization, the impact from crisis event to organization may be mitigated or reduced. The implementation also may create potential opportunities for organizations to achieve their business objectives and strategies. As a management tool, Enterprise Risk Management (ERM) is being used by an organization in managing, evaluating, and mitigating the risks that might become an obstacle to an organization in achieving its objectives. Well implementation of ERM will have a good impact on company financial performance. However, most of the previous studies could not resolve the problem in assessing the relationship between ERM implementation and a company's performance due to a lack of reliable and standard methods. Thus, the relationship between company performances with ERM has still not been resolved and needs further research in this area by academics.

Based on the literature study, there are none of the previous studies have been done on the conglomerate group of companies with having a standard ERM being implemented in all their subsidiaries companies. Many studies have been done to resolve the problem in assessing the relationship between ERM implementation and a company's performance, but due to a lack of reliable methods, they are unable to resolve the issue. As this study focuses on examining the influence of the ERM framework on company performance in a conglomerate group of companies, we could envisage how the COSO ERM framework will quantify the ERM implementation in the conglomerate group of companies and fill the literature gap.

As the number of implementation of ERM in organizations increases, the pressure in implementing the ERM creates a thought to researchers, risk practitioners, business owners, and organizations on whether ERM could generate a value and give a good impact as a return on the implementations.

Most of the scholars, law custodians, regulators, consultants, and corporate governance practitioners suggest that the implementation of ERM can positively impact the company's performance. This is viewed by many companies currently adopting the ERM framework in their organizations based on international standards.

This thesis provides an insight to organizations on the ERM implementation that will helps in determining factors that will influence the company performance. The benefits of this research are divided into several beneficial parties as follow:

Organization—Board of Directors, Chief Executive Officer (CEO), and senior management of the organization will prepare and develop much resilience and better strategies in achieving organizational objectives. Well implemented ERM

framework in an organization will provide reliable insight for management in preparing the company's Annual Management Plan (AMP), company strategic initiatives, the annual budget for Capital Expenditure (CAPEX), and Operational Expenditure (OPEX) and cash flow projection.

Holding company—Having a well-implemented ERM framework in all subsidiary companies will help the holding company examine the ERM implementation gap among the subsidiary companies. Companies with a low level of ERM performance must be assessed on the ERM implementation in their organization to increase the effectiveness of the ERM framework in respective companies. By understanding the relationship between ERM performances and company performance, a holding company might determine any threat in advance or any potential opportunities for the subsidiaries. This will help the holding company provide a good and accurate insight for reporting to the shareholders or for public information to increase the interest of potential investors to invest in the group of companies.

Researchers—Lack of effective determinants for ERM is the main obstacle of good ERM implementation measurement (Beasley et al., 2008; Gordon et al., 2009; McShane et al., 2011; Pagach & Warr, 2010). This study provides an approach to determine the most influential factor in the ERM framework that will impact company performance and gauge the effectiveness of ERM framework implementation in the organization. Researchers may adopt this reliable approach to conduct further studies in ERM framework implementation in various fields of business.

Regulators—In Malaysia, most of the regulators/custodians that governing the risk management didn't put any obligation to recognize listed companies that comply with any ERM framework. However, the regulators are actively supporting in maintaining effective risk management in all organizations in Malaysia through various channels such as Malaysia Companies Act 2016 (Sect. 246), Bursa's Listing Requirement (Paragraph 15.12, 15.23, 15.26), Malaysia Code of Corporate Governance 2017 (Chapter 9.1, 9.2) and Bank Negara Risk Governance 2013. This study may guide the best practice of ERM framework implementation for regulators to prepare a proper guideline or policy in the future.

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Examining Employee Performance During Covid-19 Pandemic: A Study of Aerospace Manufacturing Industry in Malaysia

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Abstract During Covid-19 pandemic situation, a lot of company facing problem in sustaining their businesses. Most organization has response to the current situation in maintaining the business sustainability. Unfortunately, the changes have been made by management has given significant impact on employee performance. This quantitative study is to examine the relationship between motivation, work environment and work from home towards employee performance. The target respondents of this study are among employee in an aerospace manufacturing company in Malaysia during Covid-19 pandemic situation. Statistical Product and Service Solutions (SPSS) and Analysis of a Moment Structures AMOS will be used in analyzing the data that has been collected to get the accuracy of result. The finding shows that motivation, work environment and WFH have a significant relationship with employee performance. The finding of this study is to provide insights to manufacturing company in managing strategic change management during Covid-19 pandemic as well as for future studies in revealing the factors that influence employee performance.

Keywords Covid-19 · Employee performance · Motivation · Work environment · Work from home

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_67

1 Introduction

The end of 2019 is the beginning of a kind of epidemic known as the novel corona virus (Covid-19). The virus has become a worldwide pandemic causing a high number of deaths. In addition, the pandemic has also hampered economic sectors around the world starting in 2020 (Alshurideh et al., 2021; Amarneh et al., 2021; Wang et al., 2020). This Covid-19 pandemic crisis has affected to the uncertain global economic, social and community that cause leadership to response and make significant changes in an organization to strengthen company financial stability and plan for future growth (Al-Dmour et al., 2021; Leo et al., 2021; Shah et al., 2021). When a significant change is required, leadership should quickly increase their sense of the situation and adjust their competency as well as responding to it by relying on their professional's instinct and Human Resource Development, HRD. Critical planning of strategic change management is required. Changes to a more transformational leadership style are needed in making effective decisions on the survival of the company. This is because, an organization will grow under leaders that gives a strong purpose and roles, excellent communications, share their leadership values, concern on employee's emotional stability, make sure employees can access to the technology, ensure the organizational health and resilience during the pandemic.

Readiness to change and careful planning can derive the effectiveness of transformational leadership. Periodic evaluations as well as appropriate incentives in making change plans are important for every management. To attract employee commitment and create a common vision, a comprehensive effort in changing the attitudes, values and beliefs of all employees is among the normative methods of using the hearts (empathy) and minds in making plans. With good communication and interaction between leadership and followers, providing knowledge and clear organizational goals is one of the adaptive planning methods. Change requires negotiation, consensus and agreement from the interactions that take place (Abbasi, 2017).

While change is taking place, the ability of transformational leaders to motivate their employees is important in shaping the culture of a fair organization. In other words, fair interactional and procedural become important factors in increasing intrinsic motivation and preventing demotivation from occurring among employees in the organization (Deschamps et al., 2016).

Strategic change management is very important in making strategic decisions in determining and planning the future of a company. It is more about planning for the long term to ensure the future growth of the company such as formulating strategies, implementing strategies and re-evaluating the strategies implemented as well as making improvements (Lynch, 2018). Effective strategic change management gives the company value added, seeks, creates and strengthens in overcoming its competitive position (Fuertes et al., 2020).

1.1 Overview of Selected Company

CTRM Aero Composites is a wholly-owned subsidiary of Composites Technology Research Malaysia Sdn Bhd (CTRM) of which CTRM Sdn Bhd is a member of DRB Hicom. CTRM is a composite component manufacturer in the aerospace manufacturing industry sector which is confined to the wings and engine cover of an aircraft, supply for main commercial aircraft manufacturer in the world such as Airbus SE and Boeing Co. As the pandemic strike down the world's economy, airliners delaying the aircraft ordering or even canceling order books due to high fuselage reserves. CTRM also did not escape from this crisis since customers have reduced their demand by approximately 40% and this has impacted in a reduction of company revenue. The company needs to survive to maintain in this sector of the industry, otherwise 2200 of employees will lose their jobs.

1.2 Background of Study

Covid-19 pandemic has swept away billions from the aviation industry where the global crisis has narrow down the profit margin as well as weakened the sector growth. The crisis has given a global impact on air traffic where a drastic drop in the number of world flights is due to the Movement Control Order (MCO) across the country to curb the virus from further spreading. International flights have a very bad impact compared to domestic flights. However, the domestic aviation market experienced a steady decline due to lack of demand for airlines (Suau-sanchez et al., 2020).

According to the International Civil Aviation Organization (ICAO) reported on 25th May 2021, there was a significant decline of 60% overall in passenger numbers and about USD 371 billion of airline revenue suffered losses on gross passenger operations, impact from the Covid-19 pandemic on world scheduled passenger traffic for 2020 compared to the previous year. Nevertheless, in 2021, the decline in passenger volume is estimated at 41–49% with approximately a fall in revenue on airlines from USD 274 billion to USD 322 billion of gross passenger operations (ICAO, 2021). The crisis has narrow down the profit margin as well as weakened the sector growth.

Some leaders will respond to the crisis by rising up and facing the challenge of strengthening the economy, society and community while there are also leaders who will disappear from the struggle. At that time, authentic leaders will help the entire system in an organization and strive to overcome limitations and fears as well as further increase their performance (Dirani et al., 2020). A crisis is something unexpected that can cause stress in an organization. It occurs when there is a strategic gap due to a lack of adaptation to the changes taking place in the organization. Strategic leadership plays important roles in crisis management process (Obeidat & Al Thani, 2020). In every change that leaders have made in setting goals, they will lead to the overall performance in the organization which is basically determined from the performance of the employees.

Employees will become depressed due to the financial pressures faced during the crisis which in turn affects their productivity. In the efforts of the management has been carried out in ensuring the stability of the company has resulted in a negative impact on employee morale. Employees will feel insecurity in their jobs, fear of a pandemic, unable to adapt in the new norm situation as well as feel anxious about the future of the company. This has caused employees to lose their focus in achieving company goals as a result in declining of employee performance and in turn have an impact on the organizational performance.

In existing studies, researchers study the effects of Covid-19 pandemic on employee performance in the global aviation industries were limited to aviation services providers as well as air transportation (Alkadash & Alamarin, 2021; Buhusayen et al., 2020; Liu et al., 2020; Melas & Melasová, 2020; Suau-sanchez et al., 2020). However, there is a limited study on the effect of employee performance in aerospace manufacturing sector. Therefore, this study will determine the factors that will influence employee performance through motivation, work performance and Work from Home.

2 Literature Review

2.1 Employee Performance

Employee Performance (EP) is dependent variable that need to focus on this study. In an organization, the organizational performance indicates a company's ability to achieve independent goals efficiently. The employee performance is among the elements that can assess the efficiency of an organization through its level of productivity (Almatrooshi et al., 2016).

Employee performance can be influenced by many factors, especially during Covid-19 pandemic where the new normal changes affect employee performance. Reactions to change during a pandemic have a negative impact on employee performance. As organizations try to adapt to new situations or crises, there are changes that need to be made especially for safety. The changes basically are the barrier for employees to perform on their daily task to meet organization goals (Hamid et al., 2020).

2.2 Change in Management

To adapt in current situation, leaders need to react quickly and do some changes in strategic management plan in order to survive in the industry. Due to changes in management decision have resulted in several factors that have influenced the performance of employees. There are three factors as dimension for independent variables

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that need to be study which give the significant impact to Employee Performance. They are motivation, working environment and work from home.

2.2.1 Motivation

Motivation in work is measured through three components, namely the intrinsic motivation component, the extrinsic motivation component, and the demotivation component. Extrinsic motivation refers to rewards for an achievement, annual increments, food subsidies, and other things that refer to short -term motivation. Intrinsic motivation refers to appreciation, job security, good work environment, job safety, willingness to work with high commitment and others that include motivation for the long term.

By providing extrinsic motivation in the form of rewards such as overtime pay during the Covid-19 pandemic, rewards to employees who innovate in the employment process as well as savings in operating costs, etc. which play an important role in helping meet the company's operational needs. Nevertheless, it should be noted that this short-term motivation will not last long and will put risk to the company such as retrenchment, absenteeism, turnover, as well as job dissatisfaction, especially during this pandemic situation. It must be followed by intrinsic motivation whereby employees will feel more valued for success and performance achieved as well as safety in the workplace and strong working environment (Christian et al., 2020).

2.2.2 Work Environment

Every employee needs a comfortable and safe work environment, either physically or mentally. During Covid-19 pandemic, safety and optimal work environment can help employees to increase their job performance (Susilo, 2020). Therefore, it is important for an organization to create better work environment to make sure employees maintain their performance. It is because a conducive work environment can increase the efficiency of employees to work which will affect employee performance (Aropah et al., 2020).

2.2.3 Work from Home

WFH is known as telework where it is a flexible work arrangement when the employee works from home and is not in the office or on the production premises, without contact with colleagues, but the ability to communicate with colleagues using information and communication technology (Aropah et al., 2020).

Throughout the Covid-19 pandemic, work from home (WFH) has become an alternative for every company in pursuing day-to-day work. WFH will have a positive effect on employee performance where performance will increase as employees are given the freedom to reorganize work from home. WFH mode also can increase

stress on employees due to constraints that occur such as lack of resources and direction, disruption during WFH, fear of something unknown, technology issues, communication issues, time management, and so on (Sahni, 2020). However, there are advantages and disadvantages during WFH. The advantages of working from home are the working environment is more flexible, avoid transportation cost and traffic, no time constraint, very relaxing and not subject to the company rules. But the disadvantages are we need to pay electricity and internet cost. Besides, we will be more vulnerable to data security problems (Purwanto et al., 2020).

2.3 Underpinning Theory

Typically, employee performance will decline with organizational restructuring, innovation, mergers and downsizing. With effective leadership, employees' development, motivation, communication, organizational culture, and self-directed team can overcome employee performance problems (Daniel, 2019). In existing studies, researchers study the effects of Covid-19 on employee performance in global aviation industries were limited to aviation services providers as well as air transportation (Alkadash & Alamarin, 2021; Buhusayen et al., 2020; Liu et al., 2020; Melas & Melasová, 2020; Suau-sanchez et al., 2020). There are still limited of studies has been conducted on the effect of employee performance of the aero composite manufacturing sector.

There were a study shows the negative impact of Covid-19 and reaction to change on employee performance of Bangladesh. This is because they are unable to adapt to changes with new norms that affect the way they communicate and work concentration (Hamid et al., 2020). (Alkadash & Alamarin, 2021) recommend that SME's company need to consider motivation, work environment and job satisfaction factors where they show positive significant effect to the employee performance. In another study, employee motivation had a positive relationship to employee performance. Rewards and recognition are among the motivations that influence the positive relationship with employee performance. In addition, job security as well as a good work environment also have a positive relationship with employee performance. This hypothesis is as explained in Maslow's theory of Need Hierarchy because meeting their needs is more motivated and directed towards good output (Sandhu et al., 2017).

According to Christian et al. (2020), in the midst of the current Covid19 pandemics, the main needs of employees are focus on physiological needs in daily life as well as safety in employment, health and a strong work environment as other human needs are subject to current policies in curbing the current Covid-19 virus from spreading with the practice of physical distancing, self-quarantine as well as government movement control orders. The purpose is to maintain employee motivation throughout the pandemic.

Based on the results of previous studies, this research puts forward the following hypotheses:

H1: Motivation has significant impact to Employee Performance.

New normal has changed the work environment for any organization through Covid-19 pandemic. It has impact on daily activities where employees have limitation to perform daily tasks as they need to comply with government SOPs such as social distancing, wearing face masks, frequently wash their hands, sanitize workplace before and after working, no physical contact or attend any outside activities and implementation of MCO. From the study of the impact of Covid-19 on the employee performance of Bangladesh has shown the negative relationship where the fear of this pandemic has disrupted their daily routine, ways of communication and their behaviour (Hamid et al., 2020).

Based on the study, this study was made with hypothesis:

H2: Work Environment has significant impact to Employee Performance.

Based on a study wrote by Sahni (2020), among service industry employees, WFH can increase the level of stress and challenges. The findings of her study have supported the notion that the need for an effective organizational support system from management, society and psycho-social are very important. According to Susilo (2020) in his empirical study which are most of the respondents come from HR and Marketing sector shows, the people that work from home have a relationship with the job performance, job satisfaction, work environment and work motivation. However, they show that WFH has no significant relationship with job performance (Susilo, 2020). (Purwanto et al., 2020) showed the impact of WFH on Indonesian teachers where there are positive and negative impact on their performance.

The argument has come out with the next hypothesis:

H3: Work From Home has significant impact to Employee Performance.

2.4 Research Framework

(Fig. 1)

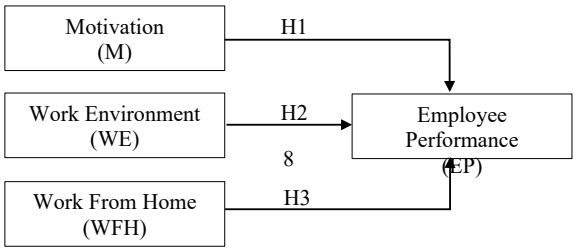

Fig. 1 Research framework

3 Methodology

3.1 Research Method

This study is a quantitative study where the respondent's coverage is among employees at CTRM, Batu Berendam, Malacca, Malaysia. This survey question has been adopted by previous studies and there have been modifications to the question to suit the scope of the study (Hamid et al., 2020; Susilo, 2020). This survey question was produced using the Likert scale in the section that focuses on dependent variable and independent variables, while in the demographic section using the category scale. There are five Likert scales used from 1 to 5 (1-strongly disagree, 2-disagree, 3-neutral, 4-agree, 5-strongly agree) are used to indicate the most appropriate answer from the respondents.

Questionnaires will be distributed to employees via Google form where the respondents are from executives and non-executives' level with experience more than 5 working years without consideration of gender, age, income & department. It is because, the majority of employees has 5 to 7 years working experience in the company. The contribution range is 10–15% of respondent for both executives and non-executives' level from the population (approximately 2200 of employees in the organization) and this study observation performed on post covid situation in FY2021. From the contribution range, 10% of senior management (Head of Department and above), 30% from middle management (Area Leader, Supervisor and Head of Section) and 60% from technicians had been involved in this study.

However, there are limitation of resource which sample population will not represent of total population of employee. Besides, high minimum range of experience employee might interrupt in data analysis to evaluate the effectiveness of change have been made. This study is conducted on only one company in the aerospace manufacturing sector in Malaysia. The small sociodemographic differences between our volunteer sample and the overall study population are not expected to greatly affect in the results.

3.2 Data Analysis Method

Based on the probability method sampling, random sampling techniques have been used in determining the sample for this study which involved full-time employee in aero composite manufacturing company. Questionnaires were distributed to employees in every department within the company via an online Google form. The study population is composing of employees working in the aero composite company in Malaysia. After receiving feedback from respondents, data will be extracted from the Google form for the evaluation and analysis process. Data obtained will be compiled using appropriate statistical analysis techniques. Statistical Product and

Service Solutions (SPSS) and Analysis of a Moment Structures (AMOS) will be used in analyzing the data that has been collected to get the accuracy of result.

4 Conclusion

The main objective of this study is to examine factors that have relationship with employee performance in an aerospace manufacturing company in Malaysia during Covid-19 pandemic. Review of the literature has shown the effects of motivation, work environment, and WFH on job satisfaction and consequently influence employee performance during the pandemic. The study has shown that motivation, work environment and WFH have a relationship with employee performance.

All other studies have agreed that motivation has a significant impact on employee performance during the Covid-19 pandemic where employees will be more diligent in achieving good performance if they are given appropriate rewards and appreciation. The work environment also has a significant impact on employee performance where if the workplace is safer, it will improve their performance. WFH shows a relationship to employee performance in different view. WFH will have a positive effect on employee performance where performance will increase as employees are given the freedom to reorganize work from home. But WFH also might increase stress among employees due to lack of resources, technology constrain and any other boundaries which caused mental health that leads to prolonged stress or even psychosomatic illness. Therefore, to sustain employee emotional, support by organization and community is require during crisis like Covid-19 pandemic and in turn will affect their mental health. However, motivation, work environment and WFH have a significant relationship to job satisfaction as a mediator and in turn have an impact on employee performance where if employees have satisfaction in doing work, then employee performance will increase.

Malaysia is in the process of providing vaccines to all citizens. In achieving herd immunity through the National COVID-19 Immunization Program (NCIP) implemented by the government will provide opportunities to all industries, especially in the aerospace sector in reviving the country's economic sector. Although the economic sector is opening up gradually, this does not mean that it is safe out there. The virus can spread through the airborne and can cause an increased case of Covid-19 infection. Thus, the results of this study will provide insights into future studies in revealing the factors that influence employee performance to help organizations give more focus to these factors during making company's strategic management changes when the organization is facing difficult situations such as this Covid-19 pandemic, in order to achieve the desired goal besides curbing the Covid-19 viruses from further spreading into the community. This can also give guidance to the company in developing a vision, mission or business strategy plan. Human Resources Department (HR) should also be involved in identifying factors that influence employee performance where HR involvement in increasing employee engagement is very important.

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The Effect of Virtual Working Team on Job Performance: A Study of Aerospace Manufacturing Industry in Malaysia

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Abstract Job performance is one of most businesses' measures to ensure that their business is sustainable, lucrative, and expandable. It is also an important level indicator in Malaysia aerospace manufacturing industry to maintain competitiveness in the global market. By the end of 2019, when a pandemic had hit the world, the situation became more challenging where the government-imposed movement controls to prevent the disease from spreading. This situation led most aerospace manufacturing companies to explore alternative measures to maintain their business operations, including introducing work from home as a virtual working team for their indirect workers. As this strategy is just introduced in Malaysia aerospace manufacturing sector, the concern arises as to the extent of its impact on their job performance. This study purposely to examines the influence factors in the virtual working team environment and its relationship to job performance. Therefore, the findings hope to provide valuable insights to Malaysian manufacturing organizations in effectively managing their virtual working team and enhancing their employees' job performance.

Keywords Job performance · Virtual working team · Team coordination · Communicate frequently · Quality of work · Effective communication

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_68

1 Introduction

Malaysia's aerospace manufacturing industry has been critical in developing countries' efforts to expand and flourish, especially in the manufacturing and aviation sector. This industry has been predominantly export-oriented, which is directly contributes to Malaysia's economy. For the manufacturing industry, competent employees are the most important function for the sector to survive for a long business period. Understanding and exploiting the implications of the job performance, which is advantageous to both employers and employees. Employee performance refers to how efficiently and effectively a person does their work (Purbasari and Septian, 2017). An organization must understand how its employees perform at work to succeed in a worldwide competitive market. Employees' effort to achieve organizational objectives is determined by whether the individual succeeds or not in completing each strategy outlined and implemented effectively. It is attractive to know and discuss components of their working environment aspect related to their job performance. The issue of job performance becomes interesting to investigate in perspective of what factors can influence employees' performance.

Many factors can influence employees' performance in the manufacturing industry; however, this study will focus on a different situation where the global is dealing with a pandemic that impacts the entire socioeconomic system. To protect the community and prevent the spread of the disease, the Malaysian government has taken proactive strategies by imposing Movement Control Order (MCO). Only a few essential businesses categories are allowed to continue their operating after getting approval from the Ministry of International Trade and Industry, Malaysia (MITI). However, the approval is subject to stringent requirements with limited numbers of workers in the plant (not exceeding more than 60%). In addition, they must adhere to the government's Standard Operating Procedures (SOP). This situation gives the leadership a challenge in completing their task effectively to the given timeframe. When working from home as a virtual working team, the main concerns raised were how they managed their way of communicating effectively and the factors influencing their job performance.

1.1 Background of Study

Job performance refers to the standard to which an employee satisfies the variables specified in the job description. It also depends on an employee's abilities, experience, seriousness, and the amount of time available to perform the task (Raharjo & Sulistiasih, 2019). According to Bokhori and Halim, several factors are influencing on an employee's performance, such as personal issues, supervisory attitudes, work environment, general company culture, working conditions, job responsibilities, teamwork, employee relationships, non-financial and financial incentives rewards, and flexible working hours. Managers need to assess if their subordinates are doing

their jobs effectively and efficiently or room for improvement (Robbins, 2009). The performance of each employee has a significant impact on the company's overall performance (Onyebuchi et al., 2019). As for the aerospace manufacturing sector, it is critical to guarantee that the global supply chain is adequate to deliver commercial aircraft components so as not to be disrupted. Due to the new Covid-19 pandemic situation, many authorized industries have minimized the number of workers in their manufacturing plants to curb the spread of disease. This led to most non-direct production employees working from home as a virtual working team to communicate among employees, suppliers, and customers.

The effective virtual working team on daily routine work becomes a critical aspect that needs to be focused on since it will influence job performance. However, there were limited studies on virtual working teams related to the manufacturing industry, especially in the aerospace manufacturing sector in Malaysia. Hence, this study aims to evaluate the factors influencing job performance for Malaysia's aerospace manufacturing companies working in virtual communication during a pandemic. There are two main objectives outlined in this study; to examine the factors influencing employees' job performance of effective virtual working communication and identifying strategies for employees to enhance their job performance by effectively working in communication during a pandemic.

By conducting this research systematically and ordered, it is important to show how the study is performed. This study is limited to the Malaysian aerospace manufacturing sector and its employees, which are specializing in the aero-structure manufacturing industry and dealing with global suppliers and customers. The study focuses on the employees who have worked as a virtual working team and communicate during the pandemic from the year 2020–2021.

2 Literature Review

At a company level, the organization's dedication to systematize the objectives and mission of every individual in the company and collaboration with high-level management is required to manage the company as effectively as possible (Raharjo & Sulistiasih, 2019). According to Kassim et al. (2009), solid organizational commitment will motivate people to work toward organizational goals and employee performance.

2.1 Job Performance

Job performance is defined as the result of an employee's best effort to complete a task depending on their skills, experience, and seriousness, and the amount of time available (Raharjo and Sulistiasih, 2019). It means the precise results that a person wants to achieve in their employment and the organization's desire to attain

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Fig. 1 Factors most likely to bring success. *Source* 2013 HBR Analytic Services Survey

those results. While Bokhori and Halim defined it as the capability and ability of an employee to accomplish their job is referred to as employee performance. The job requirement includes each employee's responsibilities, activities, and tasks in the organization. Leadership style also has a significant and beneficial impact on organizational success and employee performance (Simsek & Ozturk, 2018).

Meanwhile, three primary elements are measured for employee performance: job productivity, job quality, and job accomplishment (Iqbal et al., 2012). However, in the context of work from home or work remotely, on job performance of employees remains uncertain (Allen et al., 2015). According to Susilo (2020), the characteristics of the job itself significantly impact job performance when working in telecommuting. Telecommuting is defined as working on a computer connected within employees from home or wherever else. It is crucial for employees in advisory or supporting tasks, such as promptness in responding and good attitude attributes, such as being trustworthy (Judge et al., 2017). Management support, trust, and communication are essential success factors for a virtual working environment (Kowalski and Swanson, 2005). Based on findings from a global survey done by Harvard Business Review (HBR) in 2013 shows that the effective communication element provides the second-highest (Fig. 1) and most influential factor to enhancing employee's performance.

2.2 Virtual Working Team

Virtual communication becomes a common platform for every meeting, discussion, presentation, and reporting of all necessary information among employees as a daily routine works. Virtual communication is more complex than face-to-face,

demanding, and challenging communication (Lockwood, 2015). Effective communication includes words, behaviours, quick and correct responses in delivering information (Morgan et al., 2014). With the pressures of global economic competition and supported by the rapid development in communication technology, most organizations are increasingly focusing on virtual team's communication capabilities to increase the effectiveness in communication on their operation (Nydegger & Nydegger, 2010). Madell (2019) claimed that working remotely has weaknesses, such as a lack of monitoring, which increases the risk of miscommunication. Based on Mlitz (2021), many employees who work remotely do not have a properly designated workspace; instead, their living and work environments are mixed. Thus, employees struggling to focus while working remotely, and it will be affecting their job performance (Fig. 2).

A virtual working team, also known as the remote team, refers to a group of employees who collaborate and work together to plan, execute, and assess the progress of the project (Salas et al., 2008). Each working assignment and communication are through technology such as email, voice, or video conferencing services in order to collaborate. Although technology has improved communication ability, the performance of virtual working teams faces the challenge of losing knowledge due to ineffective coordination and communications and lack of time in sharing the information (Karayaz, 2008).

Most previous studies show that virtual team communication is more effective when it is coordinated with the right style and traits of the leaders (Balthazard et al., 2009; Hoch & Kozlowski, 2014; Kelley & Kelloway, 2012). In addition, the practical key elements for a virtual working team include frequent communication and

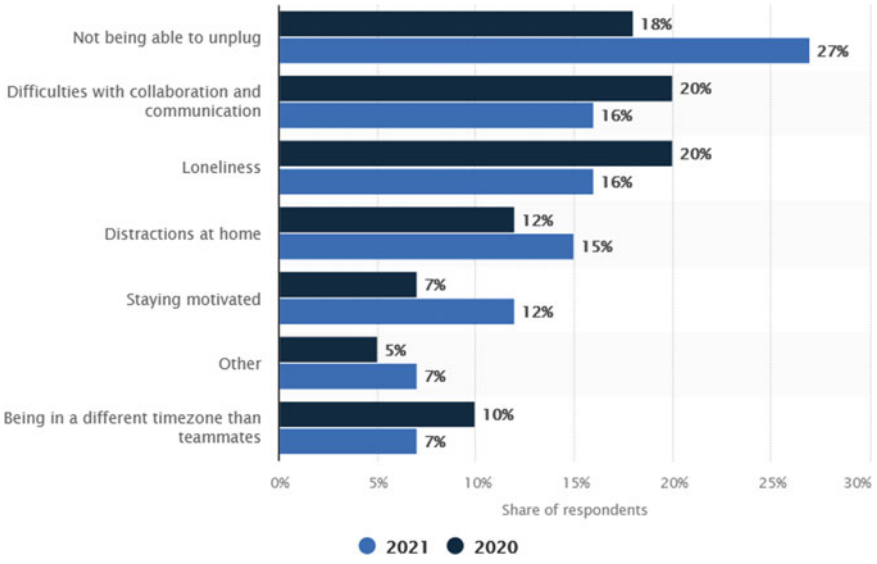

Fig. 2 Biggest struggle with working remotely. *Source* Statista 2021

have clear objectives among team members (Morgan et al., 2014). By practising regular communication positively influences the motivation of each member of the virtual team to concentrate and convey information effectively in order to complete the task perfectly according to the plan. Individual quality of work is also one of the essential parts of a virtual working team. Each employee is responsible for the output of quantity and quality required to achieve task objectives as agreed upon by the working team or their superior (Ivancevich & Matteson, 1996). According to Cullen & Sackett (2004), the concept of employee integrity itself directly impacts the quality of their job performance. Furthermore, to complete all of the tasks every day, employees must consistently have a certain level of commitment. Working as part of a team requires synchronization and subsequent interconnected activities across team members; small mistakes or delays will affect the team's goals and performance.

2.3 The Relationship Between Virtual Working Team and Job Performance

Virtual working teams depend heavily on technology communication channels to coordinate their daily work. It is crucial to examine the relation between the task's structure and coordination effectiveness as it affects individual and team performance (Victor et al., 2021). Working as a team must have strong coordination among employees in an organization. Iskandar et al. (2014) claimed its absence will show difficulty in operating business operations or, more importantly, cause serious harm between individuals. In addition, according to Karayaz (2008), virtual team performance is hampered by a lack of knowledge and skills caused by inadequate coordination, poor communication, and a lack of timely information sharing. For improvement, he suggested optimizing various application forms of collaborative information technologies through a well-coordinated system. Hence, structured coordination, diverse knowledge and expertise can be developed, integrated, and deployed.

In a virtual working environment, communication is a basic fundamental necessity to be focused on. Each employee may feel isolated, and it is critical to keep them engaged by communicating with them frequently to raise their knowledge and understanding (Teresa, 2021). The team should communicate more between virtual employees by having regularly scheduled meetings to ensure each assignment is carried out smoothly as planned and not jeopardize the team's performance. According to Morrison and Ruiz (2020), having frequent scheduled interactions among the team will promote more open conversations and mutual agreement on each activity towards the team's mission.

Works that are accomplished efficiently and with minimum direction and supervision are critical criteria in measuring job performance. Piccoli et al. (2004) mentioned two types of team effectiveness; team performance, where on-time delivery of high-quality results or products and where individual requirements are fulfilled. However, according to Awang et al. (2015), the condition of the working environment is one of

the factors influencing employees' work speed and effectiveness. When working at home, it is necessary to create a good work environment that is both comfortable and conducive to acquire concentration and produce good outcomes. Understanding the concept of quality of work that adheres to the standards such as accuracy, neatness, attention to detail, consistency, and follows procedures will improve job and team performance.

Based on past studies in literature, several elements have been identified in a virtual working team and their relationships with job performance. Hence, there are three hypotheses have been constructed to verify the correlation between the dimension of the virtual working team and job performance as follows:

H1—Team coordination has a direct positive influencing on Job Performance.

H2—Communicate frequently has a direct positive influencing on Job Performance.

H3—Quality of work has a direct positive influencing on Job Performance.

2.4 Conceptual Framework

Virtual working teams are influenced by many factors of variables that have been studied in the literature and have resulted in a variety of models for studying and connecting them to job performance. However, the studied and theoretical concept established by Victor et al. (2021) is emphasized in this research. According to the study's findings, one of the essential variables in the model is task features. The main part of the task feature is effectively coordinate their work in communication technologies where the result gives positive influence with a high confidence level. Next, an important variable is the empowerment of the team members by the leader. Empowerment consists of sharing a vision and regularly communicating within the team to create a significant connection to the team performance. Another important factor identified in the study is working at a high-efficiency level for an extended period. It entails delivering high-quality results and solutions on time, ensuring all stakeholders' satisfaction, and increasing their job performance.

Based on this underpinning theory, the framework is designed to examine the relationship between three dimensions in a virtual working team as an independent variable and the dependent variable's job performance. The three dimensions are team coordination, communication frequently, and quality of work. The study's model was developed after a thorough evaluation of the scientific literature on the subject (Fig. 3).

3 Research Methodology

This study uses a quantitative causal method for analyzing the effect and relevance of independent variables on dependent variables. Quantitative analysis is based on

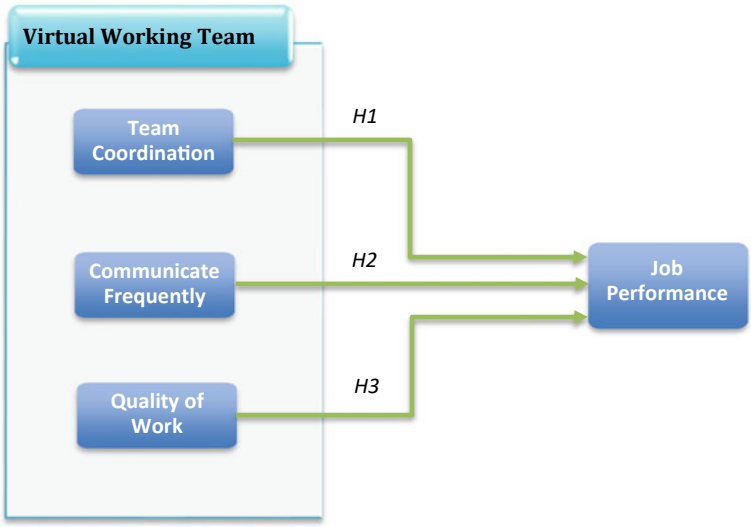

Fig. 3 Research conceptual framework

numerical results and delivers systematic conclusions covering a wide range of research topics while being more efficient, effective, and cost-effective (Ticehurst & Veal, 2000). The selected method is similar to the previous studies that have almost related to the topic (Iskandar et al., 2014; Susilo, 2020; Victor et al., 2021).

This study employs inferential statistics approaches, which means it aimed to answer the research questions by collecting and analyzing the samples and then generalizing the outcome to explain a population. Data collection will be conducted by distributing the questionnaire and completing online to the relevant aerospace manufacturing industry in Malaysia. For the population design, respondents' selection was based on an executive level in random departments, including managers, associate managers, and senior executives. Assuming that all respondents have work experience and can work from home, it is justifiable to ensure they have access to the internet. Therefore, the Purposive sampling method is being used because it is for employees who had access to the internet and had direct experience working in virtual communication. To help gather respondents, the questionnaire link will be distributed through any means of social media. The responses are measured using a 5-point Likert scale and evaluated accordingly: 1-strongly disagree; 2-disagree; 3-neutral; 4-agree; 5-strongly agree. The questionnaire targeted 500 respondents. All data will be check for response bias, validate the theory and evidence to support the interpretation. Reliable responses data will be kept and analyze further. For statistical analysis, SPSS and AMOS software will assist with the required analyses to effectively evaluate all reliable responses. The results will be presented in figures, tables, and charts, making them easier to interpret.

4 Conclusion

This study demonstrates how a realistic conceptual framework was developed to investigate and understand current factors existing in virtual working communication and their relationship to job performance. It is made a decisive contribution to the research of the influencing factors in virtual working teams on job performance in Malaysia's aerospace manufacturing industry. Furthermore, by analyzing this study's findings, the employees could improve their job performance by implementing appropriate and effective virtual working communication.

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Creating Organizational Culture that Compact Corruption in Local Government: The Role of Municipal Leadership

Ehap Alahmead, Susan Boser, Ra'ed Masa'deh, and Muhammad Turki Alshurideh

Abstract Corruption in U.S. local government is a phenomenon that boosted by the decentralization tendency. Most of the literature focus on reducing opportunity for corruption by monitoring and controlling the local governments' transactions. However, opportunity reduction faces limited success in combating local governments' corruption. This chapter highlights the need to focus on corruption rationalization. According to the Fraud Triangle Theory, committing a crime requires not only an opportunity but also a rationalization process that precedes or follows the crime. The rationalization is a defense mechanism that aims to normalize the crime and restore good self-image by claiming for instance that everybody practices the crime, the crime did not hurt anyone, or the crime was unavoidable etc. This chapter focuses on how corruption in local governments is normalized (rationalized). Particularly, the role of local governments' leadership in creating and/or maintaining an organizational culture that rationalize corruption.

Keywords Literature review · Corruption opportunities · Public sector

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_69

1 Introduction

According to Agha et al. (2021), the interest in studying ethics in the U.S. government increased after the Watergate crisis. The Ethics in Government Act of 1978 established the federal Office of Government Ethics (OGE) to lead and direct ethics management in the executive branch (Agha et al., 2021). The OGE requires each federal agency to have an ethics officer to conduct training and keep paperwork of the ethics record (Agha et al., 2021); however, the OGE requirements are overwhelming to federal employees and reduce their performance (Yang, 2009). The OGE concerns with the integrity of the federal employees; when it comes to municipality officials, the federal government has no crucial role in managing their integrity (Mackenzie & Hafclen, 2002). At the federal level, power is distributed between three branches of government, and the legislative branch (Congress) is also divided between parties. If a decision is to be taken to govern municipalities, it requires the consensus of a large number of actors (Mackenzie & Hafclen, 2002). Moreover, due to the municipalities' independency, any federal prosecutions are perceived as a violation of the local government sovereignty; besides, Washington is not concerned if a municipality lacks on ethical standards or financially corrupts as long as no federal fund is involved (Berman & Carter, 2018; Zhao & Peters, 2009). Thus, addressing local governments' integrity is the role of the state government and the citizens.

Most of the literature reviewed for this study is focused on corruption opportunity. It seeks preventing (or reducing) the chance for corruption by monitoring and controlling the transactions of local government staff and hold them accountable. While reducing the opportunity for corruption is very important, it is not enough; as the Fraud Triangle theory (Brown, 2005) presumes, fraud requires three factors: pressure, opportunity, and rationalization. Some research such as Cressey (1973) added a fourth factor to the Fraud Triangle theory, the capability. Capability includes position within the organization to create or exploit an opportunity for fraud, being smart to understand and exploit internal control weaknesses, strong ego and great confidence that he will not be detected, ability to coerce others to conceal fraud. Capability as introduced by Cressey (1973) is part of the opportunity factor not a separate one. Without having predispositions like courage and cleverness to exploit a situation and without being in a position in the organization that enables corruption, we cannot say that there is an opportunity for corruption. The study Wolfe & Hermanson (2004) explores religiosity (commitment to anti-fraud religious values) as another factor to understand fraud. Religiosity also is not a new factor; it deals with religious values that influence rationalization. Religious values like honesty and integrity mark the absence of corruption rationalization for the individual who is committed to these values. Thus, the Fraud Triangle theory is stabilized at the three factors of pressure, opportunity, and rationalization (Said et al., 2018).

The incentive (pressure) for corruption does not require much focus because it usually exists whether to satisfy a need for higher income (Free, 2015); or to satisfy a want like living a lavish lifestyle, and abusing drugs (Liu & Lin, 2012). The corruption opportunity is heavily studied, and it may be less important than

corruption rationalization (Muhtar et al., 2018). The research work (Muhtar et al., 2018) study corruption in Indonesia local governments focusing on the influence of opportunity factors like e-government (public easy access to information that improves transparency and combat corruption), and rationalization factors like the response on audit result (recommendations on audit result that received no follow-up from local government). The results show that the rationalization factors have effect on corruption; meanwhile, the opportunity factors like e-government and internal audit show no evidence of effect on corruption. In this research we will focus on corruption rationalization.

2 Literature Review

The literature review starts with discussing the three main approaches to eliminate corruption opportunity namely transparency, citizens involvement, and recentralization and explains why these approaches are problematic. Then, a discussion of corruption rationalization follows and illustrates why rationalization should be attributed to the organization culture (not only to individual characteristics). Finally, the organization culture section discusses how organizational culture emerged and maintained before ending with section on the role of municipal leadership in constructing the organization ethical culture (Ravisankar et al., 2011; Alshraideh et al., 2017; AlShurideh et al., 2019; Ashal et al., 2021; Hamadneh et al., 2021).

2.1 Opportunity

The literature in local government corruption focusses on combating corruption opportunity, which depends on the probability of being caught by auditing or monitoring systems (Nuseir et al., 2021; Al-bawaia et al., 2022). Eliminating corruption opportunity "is to deter and prevent corruption via a system of thorough and efficient observation and surveillance, including accounting, auditing, and layers of oversight" (Silva, 2010). Opportunity for corruption may depend on the economic activity in the local government area; when tourism is the major activity, there is more presence of pressure groups and lobbies who may directly participate in the political system and corruption may flourish more easily (Gong, 2015). Corruption opportunity may increase in crisis times when local officials are given relief aid and simultaneously the natural disaster brings disorder and infrastructure collapse, i.e. less chance for being caught (Anechiarico & Jacobs, 1996). Many approaches to eliminate corruption opportunity are discussed in the literature; for instance, having more women in the local government (Jimenez et al., 2017), restructuring anti-corruption agencies to produce more comprehensive integrity management (Al-bawaia et al., 2022), reducing the size of the city council (Nguyen et al., 2017), or reshaping incentive system and based it on citizens' perception of low corruption (Vijayalakshmi, 2008).

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However, the three approaches to eliminate corruption opportunity that have the most attention in the literature are transparency, citizens' involvement, and recentralization (as will be discussed next).

2.2 Transparency

Members of the government are more prone to corruption because they have more control over the flow of information than citizens (Bergh et al., 2017). The more transparency (the more timely information delivered to citizens), the more the citizens power to monitor the government performance and combat corruption (Bergh et al., 2017; Schopf, 2018). Transparency improved by providing the public with easy access to information (Muhtar et al., 2018). This can be achieved through information technologies such as websites, social media, and mobile technologies; the citizens who interact with municipal government through information technology have better perception of the municipality's transparency and integrity (Kim et al., 2009; Benito et al., 2015; Al Dmour et al., 2014; Valle-Cruza et al., 2016; Akour et al., 2021; Al-Hamad et al., 2021; Alshurideh et al., 2021a). Moreover, according to Vijayalakshmi (2008), transparency can be improved by attaching the official's names to government documents to clarify responsibility and establishing a computerized information center to provide citizens with information about their application's progress and related administrative rules. In addition to using information technology, law should be amended to improve transparency. Law should be amended to require posting lease or sale of property with big font on the city hall, as well as establishing an independent database of lease or sale of property (Alshurideh et al., 2021b). Law should guarantee that records and meetings are open to public to hold the local government accountable and prevent elected officials from concealing their corrupt practices (Suleman et al., 2021). Budget law should include clear rules on the timing and specifics of disclosure requirements for key items such as payments, debt, departmental budgets, as well as legal liabilities for breaching the disclosure norms. Finally, to improve transparency, local media should be developed because underdeveloped media hardly puts any pressure on the local officials (Gonzalez et al., 2017); meanwhile, municipalities with strong media presence are more likely to abide with state-mandated ethics (Ferraz & Finan, 2011). The hope of promoting transparency is that it may invite public supervision (Al-bawaia et al., 2022; Fording et al., 2003), however, even when transparency makes corruption known to the public, the public may not confront it (Suleman et al., 2021).

2.3 Citizens Involvement

Central authorities encourage local agents to actively participate to improve anti-corruption effectiveness by holding the local government accountable to citizens

(Al-bawaia et al., 2022). To reduce opportunity for corruption, citizens need to volunteer at public hearings and committees, discuss public issues they know through the media, exchange their ideas/opinions, and stand up in county meetings or city council to air their complaints (Suleman et al., 2021). Citizens can also participate by establishing a committee of outside experts to receive appeals and investigate bureaucrats, and a citizen's court that is comprised of outside academics, lawyers, and journalists to decide corruption prone issue (Vijayalakshmi, 2008). There should be effective auditing programs that monitor the elected officials' corrupt actions and timely disseminate the auditing results, i.e., shortly before an election (Coxson, 2009). Otherwise, if the citizens lack meaningful information to cast a meaningful vote, they elect officials who lack accountability to them (Klasnja & Tucker, 2013). Citizens can discipline local officials rent seeking behavior by the power of their vote; mayors with eligibility to run again are less corrupted than the second term mayors specially when the probability of corruption being detected (by judiciary agents or media) is high (Bobonis et al., 2016); municipalities in cities with high levels of electoral competition are more likely to abide with state-mandated ethics (Ferraz & Finan, 2011). Citizen's report of corrupt behavior is also an anti-corruption tool; to improve the local officials' integrity, the reporting mechanisms should be enhanced (Al-bawaia et al., 2022). There is a need to increase the public awareness of corrupt behaviors and where to report them (Alshurideh et al., 2021b).

However, relying on local agents to report corruption may not be effective. Many people do not want to involve because strong evidence is required before reporting corruption, anonymity is not guaranteed, or they do not understand their rights; even if they take the decision to report corruption they may not know where to report it (Asthana, 2008). Reporting corruption requires two preconditions, first, positive perception of the quality of anti-corruption governance (i.e., believing that their report will be taken seriously and make difference); and second, a low level of tolerance towards corruption (Masters & Graycar, 2016), both conditions are not guaranteed. For the first condition, people may not believe in their report influence because as it moves from an agency to agency, the report diminishes, it changed from the hard language of allegation to a softer approach to administrative action which makes the act of corruption disappear (Asthana, 2008) Regarding the second condition, people may tolerate corruption, (Muhtar et al., 2018) find that while in 'low-corruption' countries like Sweden voters punish corrupted politicians regardless of the state of economy, in 'high-corruption' countries like Moldavia, voters punish corrupt officials only when the economy is bad. Thus, relying on citizens or local agents' engagement to reduce opportunity for corruption may be problematic because these citizens may not have the knowledge (Alshurideh et al., 2021b), the desire (Suleman et al., 2021), or the ability (Asthana, 2008) to stand against corruption in their counties or cities.

2.4 Recentralization

Government decentralization refers to the "redistribution of powers of decision making in favor of lower levels of administrative machinery" (Gonzalez et al., 2017), Governments decentralized authority to local level assuming that local governments can better tailor the public good to suit local populations (Assad & Alshurideh, 2020). The division of authority among local governments enhances the chance for corruption (Hess, 2017) because as the authority devolves from upper levels, local officials have fewer constraints and more opportunities to abuse their power (Masters & Graycar, 2016). For instance, fiscal decentralization (decentralize the government budget to local governments) provides local officials with opportunity for fraud and aggravate corruption in local government (Tiebout, 1956) Local officials expanded power and their deep involvement in economic affairs provide opportunity for corruption (Masters & Graycar, 2016). As Salloum et al. (2020) discussed, decentralization aggravates corruption and encourages local officials to collude against the central government in China. To solve these problems, the Chinese Communist Party linked the cadre promotion to quantifiable performance, but this policy failed so, corruption and budgetary crisis have grown in the last decades. Under the current Chinese President administration, the national leadership led a central anti-corruption campaign to constrain the local officials' authority (Bobonis et al., 2016). In the United States, decentralization of authority to local governments increases their control over policies (Berman & Carter, 2018). According to Klasnja & Tucker (2013), New Public Administration practices such as decentralization, deregulation, and privatization weaken the municipalities' accountability to the state authorities.

While decentralization contributes to local government corruption, tackling the problem by recentralizing the authority is not an effective approach (Bobonis et al., 2016). The recentralization tendency may reflect the center's desire to address the local government integrity through hierarchy (Al-bawaia et al., 2022) such as state ethics commissions that seek addressing the local government integrity problem by tracking election expenditures and establish rules for conflicts of financial interest (Agha et al., 2021). However, recentralization may be counterproductive; in New York City it led to inadequate managers' authority, increased delay, and low morals (Silva, 2010). By managing the integrity problem through the state hierarchy, the central government underemphasizes the role of public participation (Al-bawaia et al., 2022), emphasizes compliance with rules and regulations over ethics (Agha et al., 2021), treats public employees as potential corrupt (Silva, 2010), and slows down the investment attraction and development (Bobonis et al., 2016).

The previously mentioned articles represent the traditional approaches to public integrity, which focus on reducing the corruption opportunity by enforcing commissions, anti-corruption agencies, formalized guidelines, or whistle-blowing (Beeri & Navot, 2013). However, there is a need to understand corruption from a behavioral perspective that may explain the individual's response to the corruption opportunity and the organizational culture in which the corrupt behavior occurs (Ko & Zhi, 2013). The opportunity elimination approaches have met with limited success because they

neglect the human factor and the need to embed virtue and values in the individual (Beeri & Navot, 2013). Individuals who engage in corruption usually work in environment that provides definitions favorable to corruption (Collins, 2012). Although the external controls (that seek eliminating corruption opportunity) are important, public administrators should have inner check (ethical values) and adhere to democratic principles while they execute their responsibilities. In conclusion, although technical solutions cannot be neglected, these solutions alone have not proved the success that their advocates had hoped; so, other approaches like developing the organizational values are essential to complement them (Beeri & Navot, 2013).

2.5 Rationalization

Rationalization is the justification made by the fraudsters to avoid feeling guilty (Cressey, 1973). Rationalization contributes to corruption because it helps the fraudster seeing himself as an honest person caught in a negative set of circumstances (Brown, 2005). It is the greatest factor causing tolerance of petty theft—which indicates a problematic organization culture. Rationalization is the factor leading to fraud in the sense that others also do it. So, it is positively related to employees' fraud (Wolfe & Hermanson, 2004).

Although understanding the nature of fraud rationalization is critical to properly formulating anti-fraud measures, it is still an under-researched issue (Said et al., 2018). Research is limited in rationalization area because it is a kind of mystery (O'Mally, 2002), it may not be observable (Kula et al., 2011), and it is difficult to measure (Hogan et al., 2008). The government employees who committed corruption usually rationalize it before they committed it with excuses that allowed them to "innocently" carry out the act like, we have no idea that the behavior is considered as bribe, bribery is our country's culture, or we are doing this as usual. Rationalization is important to justify corruption before and after committing the crime (Casabona & Grego, 2003).

Some research focus on corruption rationalization based on objective factors like low income. The public officials wage is an important factor in justifying corruption therefore "high salary for transparency" is an important policy in preventing corruption (Free, 2015). Meanwhile, other research finds that higher civil service salaries induce civil servants to demand higher bribes (Skousen et al., 2003). So, controlling corruption by increasing civil service pay is a myth because corruption is a complex social issue that cannot be tackled at the individual level (Mohd-sanusi et al., 2015).

Some researches such as (Foltz & Opoku-Agyemang, 2015) capture corruption rationalization based on age, education, and gender. The researcher in (Gong & Wu, 2012) emphasizes that younger managers want to achieve career progression quickly, so they take risks. Meanwhile, older managers seek more information, diagnosis the information precisely, and execute decisions carefully. Therefore, age may indicate the individual's moral development. Regarding the influence of education on corruption rationalization, Machado & Garter (2018) finds that individuals with knowledge

in their work area are more aware of the unethical behavior consequences while without knowledge, individuals tend to rationalize fraud as an acceptable decision. Coming to gender, Zahara (2017) find that female executives can be more ethical in decision making than males. There are two problems with studying corruption rationalization based on age, education, or gender. First, these factors assess the likelihood of corruption rationalization not actual rationalization incidents. If the employee is an old female with good education in her work field, the researcher takes this case as a low possibility for rationalizing corrupt behavior; meanwhile, that woman may in fact rationalize her corrupt behavior. Second, studying corruption rationalization based on demographic factors (age, education, and gender) downplays the important role of individual values (Wolfe & Hermanson, 2004) and organizational values (Purcell, 2014) in explaining how individuals rationalize their corrupt behavior. This study focuses on how the municipality employees rationalize the corrupt behavior based on their organizational values (culture).

The study Troy et al. (2011) replaced corruption rationalization with "personal integrity" which shifted the focus to individualistic explanations of corruption. For instance, a person may not care about rationalizing corruption because he is an industrial psychopath who lacks empathy and behaves antisocial (Steffensmeier et al., 2013). Some individuals committed fraud because they are pathological gamblers who lost control on themselves and want money to continue gambling (Albrecht et al., 1984). Some individuals are fraud predators described as "born crooks" that continuously practice fraud (unlike accidental fraudsters) (Ramamoorti, 2008). For predators "pressure and rationalization play little or no role because the predator needs only opportunity" (Ramamoorti, 2008).

The previous discussion shows that attributing corruption rationalization to individual factors like the person's demographic characteristics (Foltz & Opoku-Agyemang, 2015) or his psychological disorders (Steffensmeier et al., 2013; Albrecht et al., 1984) may be insufficient. The violator does not invent rationalization to his violation but rather uses the verbalization from the culture he is in contact with (Brown, 2005). Rationalization "is the set of ethical values that allow certain parties to commit acts of fraud" (Kelly & Hartley, 2010). Thus, cultural mechanisms that influence fraud should be considered (Steffensmeier et al., 2013). Only few studies focused on the organizational culture role in corruption (Said, 2018). Some of these studies suggest establishing an ethics' commission that foster and support inner check like ethical standards and professional values on public officials and employees (Dorminey et al., 2012). Other study suggests adopting ethical code (a set of ethical norms and principles) to create awareness on standards of ethical behavior, guide public officials on ethically "grey areas", and help public officials internalize values (Manurung & Hadian, 2013). Some research suggests developing ethics office like the one in the city of Atlanta (established after mayor corruption scandal in 2001) that provides advice on ethical decision-making, educates city employees on ethics policy, and investigates reports on ethics violation and persecute these violations (Smith, 2003). These studies suggest solutions (ethical office, ethical commissions, or code of ethics) for a corrupted culture. My research though is concerned more with how a culture that tolerates corruption emerges.

3 Method

3.1 Organizational Culture

Based on Jerinic (2006), the following discussion traces the emergence and the development of organization culture (as a field of study). The British sociologist Elliot Jaques (1952) was the first theorist who described organizational culture. He argued that researchers ignore the human and emotional elements of organizational life because they focus on organizational structure. Jaques's work inspired organization theorists from the United Kingdom (Barry Turner), Italy (Pasquale Gagliardi), Canada (Peter Frost) and United States (Linda Smircich), who all studied organizational culture by focusing on the role of symbolism in organizational life. However, these authors viewed culture as an objective entity that can be managed or a tool to enhance performance.

According to Jerinic (2006), organizational culture researchers who adopted the symbolic perspective doubt the ease with which culture can be manipulated to managerial ends. These researchers used qualitative methods because it is difficult to define culture in operational terms that captured the nuances of meaning. Culture is constructed by interaction between individuals as they interpret their surrounding and collectively create meaning. If the meaning is to be understood, it should be studied in the location and situation in which it was created by observing how the organization members speak about this meaning. The study Green (1997) stated that "Believing with Max Weber, that man is an animal suspended in webs of significance he himself has spun; I take culture to be those webs, and the analysis of it to be therefore not an experimental science in search of law but an interpretive one in search of meaning." In other words, culture should not be studied as an objective matter that is governed by universal laws (regardless of social context); rather, culture is socially constructed and as such, the researcher should focus on how and why a certain meaning is constructed in a particular social context. This study depends on (Geertz, 1973) theory of *norm circle* to better understand how organizational culture is developed and maintained.

Geertz (1973) explains the emergence of culture because of interactions between individuals in a group. He called that group the *norm circle* and defined it as "the group of people who are committed to endorsing and enforcing a particular norm". The interaction between the group members has a causal power to produce a tendency in individuals to follow standardized practices (norms). An example is the norm of not blocking a person's route. If person A is blocking person B's path, B may encourage conformance to the norm, for example, by a glare or a push. On the other hand, if person A conforms to the norm and stands aside, B may indicate approval by a smile or thanking A verbally. By the repetition of endorsing and enforcing incidents, person A realizes that s/he is expected to stand aside from the others path and develops the tendency to do so. In other words, the norm circle creates a disposition in person A to conform to the 'stand aside' norm by the influence of the norm circle members who have endorsed and enforced the norm. Person A, as a member in a norm circle, feels

committed to the other members and may act in their behalf to endorse and enforce the norm concerned and expect these members' support to do so.

Based on Geertz (1973) argument, culture has no ideational existence beyond its existence as beliefs or dispositions of individual human beings. It can only attain an objective aspect as the members of norm circles. If an organization has written documents of ethical codes or organizational values, it does not mean that the culture of this organization has an objective existence (as text on papers). Culture is not necessarily what is written, but rather what is actually practiced; and what is actually practiced is what the norm circle endorsed and enforced. The endorsement and enforcement of a norm by the norm circle is not only an *incentive* for an individual member to conform, it also serves as *feedback* that informs the individual as to whether his behavior was conforming with the norm or not. Consequently, the endorsement and enforcement mechanism (as feedback and behavior correction mechanism) explain how ambiguous shared values that may be understood differently by individuals still produce a relatively standardized behavior.

The study Geertz (1973) argues that culture is socially constructed because the individual's beliefs and behaviors arise from his/her communicative interactions with the other individuals in a particular social context. If these interactions changed, they produce different beliefs and then the normative environment may be constructed differently. Culture is composed of many cross-cutting norms, if these norms contradict; the individual conforms to the norm that is endorsed by the most powerful and resourceful group (i.e. the most powerful norm circle). Culture is maintained as long as the power of each norm circle is stable. However, cultural change occurs if a norm circle grows in size or influence on the expense of the other norm circles. In this case, the individuals conform to the norm that is endorsed by the newly more powerful group (instead of the norm they used to conform to).

3.2 Leadership

Culture is a group of shared beliefs and norms held by individuals; these norms are socially constructed, they are created and maintained through the individual's interactions with other members who endorse and enforce these norms. In organizational context, the leaders (by the virtue of their position and may be charisma) are powerful in endorsing and enforcing norms. The leading organizational psychologist, Edgar Schein, argues that leadership is critical to the creation and maintenance of culture; cultural norms emerge and change due to what leaders tend to focus on, the leaders role modeling, and their reactions to crises (Free et al., 2007).

According to Elder-Vass (2012), "leadership is a process whereby the leader influences others to reach a common goal". When an organization's leaders are perceived to be ethically positive, there are less reports of counterproductive employee behavior as in the studies (Northouse, 1999; Mayer et al., 2009; Al-dhuhouri et al., 2020; AlShehhi et al., 2020; Al Harahsheh, 2014). By contrast, when leaders become morally disengaged (underemphasizing the negative consequences of misconducts),

employees' ethical behavior is negatively affected (Al-Lozi & Papazafeiropoulou, 2012; Bonner et al., 2016). The values exhibited by leaders may significantly influence the values exhibited by other individuals in the organization (Alyammahi et al., 2020; Schminke et al., 2002). The ethical leader exhibits a set of traits that will promote the shared understanding of what constitutes unethical behavior such as corruption and what constitutes ethical behavior in an organization (Alameeri et al., 2020).

According to Salloum et al. (2020), leaders may influence the employees' perceptions of the organization's ethical climate (i.e., the employees' perception of what is appropriate or not appropriate behavior in their organization). In an egoistic climate, people care for themselves, protect their own interest, and have no room for personal moral, which correlates positively with unethical behavior (Pertiwi, 2018). Meanwhile, a positive ethical climate (that focuses on others) has a positive influence on ethical behavior (Peterson, 2002). An organization's ethical climate affects which issues organization members consider ethically relevant, and whose interests they consider when deciding on moral issues (O'Fallon & Butterfield, 2012).

Leadership may create a culture that highlights financial performance over ethical considerations by (Said, 2018; Free et al. 2007) communicating inappropriate ethical standards while extremely focusing on financial earnings and growth rates (Kula et al., 2011). The example of Enron Company illustrates the role of leadership in creating a culture that rationalizes corruption. According to Free et al., (2007), Enron Company had adopted one of the best management control systems in the United States. The control system requires that any deal needs to be assessed by risk analysts and approved from various levels in several departments, including approval from the most senior levels, and the board of directors. Enron also had other corporate governance mechanisms including (among other mechanisms) credentialed board of directors, an audit and compliance committee, external auditor, financial disclosure office of director, and a finance committee. In the late 1990s, Enron had a new CEO, Jeffrey Skilling, who change the organizational culture into what (Free et al., 2007) describe as a culture that is permissible for corruption. Under Skilling, an extreme performance-oriented culture emerged which institutionalized and tolerated deviant behavior. The "creative risk-taking" led to circumventing and breaking legal and ethical boundaries. The internal competition and the huge incentives led to private information, and deceit short term performance. In 2001, Enron became one of the biggest company bankruptcies in the US history. According to Free et al. (2007), the case of Enron company illustrates that despite the sophisticated control system (which supposed to reduce opportunity for corruption), when Enron leadership created a culture that rationalizes corruption (by prioritizing performance over ethics), the company collapsed.

An important example of leadership successfully changing unethical culture in the local government is the case of Cookingham (Gorsira et al., 2018), the manager of Kansas City between 1940 and 1959 as discussed by (Cookingham, 2020). For two decades before Cookingham arrived, every aspect of Kansas City was controlled by the corrupted and unelected political boss Tom Pendergast (Perego, 2019). In Pendergast time, illegal gambling was $ 12 million enterprise (roughly $216 million

in 2019), and the ghost voters were more than registered voters, which enabled Pendergast to control the city council elections. He developed a system of patronage hiring that bloated the payroll with illiterate police officers and employees who never show to work; a small note signed by Pendergast would guarantee a job in the city. Eventually, Pendergast was convicted of federal tax evasion and Cookingham was hired by the mayor and city council whose campaign symbol was a broom.

Realizing that cleaning the stairs starts from the top, the first challenge for Cookingham was to assess the ethical integrity of his team and determining who engaged in the unethical conduct. Cookingham himself was an example of ethical leader who does not compromise his principles. When he was rushed by the city council to fire the employees from Pendergast era quickly, he argued that not all employees were corrupted, and he defended them against the council with his letter of resignation ready in case he didn't prevail. Cookingham message to all employees was that the only allegiance which any employee owes is to all the people of Kansas City and that political action among the employees was discouraged. By these measures, Cookingham was a bright example of the leadership ability to influence the culture in local government.

The discussion above shows a significant influence for the organization leaders' values and ethical conduct on their subordinates. Geertz (1973) explained the individual's adherence to norm as a result of the norm circle (members) strength in endorsing/enforcing the norm. By the virtue of their position, leaders in municipalities may strongly enforce norms on subordinates. Thus, this study to recommend for asking the municipality employees about their perceptions of norms that rationalizes corruption that their leaders support/discourage, and how the leaders and subordinates construct meaning to these norms.

4 Conclusion

The literature review starts with discussing the three main approaches to eliminate corruption opportunity namely transparency, citizens involvement, and recentralization and explains why these approaches are problematic. Then, a discussion of corruption rationalization follows and illustrates why rationalization should be attributed to the organization culture (not only to individual characteristics). Finally, the organization culture section discusses how organizational culture emerged and maintained before ending with section on the role of municipal leadership in constructing the organization ethical culture.

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Reviewing the Literature of Internal Corporate Social Responsibility on Job Satisfaction

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Abstract In the last decade a social responsibility for the environment, local communities, working conditions, and the ethical practices have become necessary for any organization that is aiming to be sustainable and successful in the business world. Also, job satisfaction reflects the positive and favorable attitudes of the workers that have a great effect on their performance. The purpose of this paper is to reviewing the literature and the associations among internal corporate social responsibility, job satisfaction and their dimensions.

Keywords Internal corporate social responsibility · Skills development · Working environment · Employment stability · Work life balance · Empowerment · Intrinsic job satisfaction · Extrinsic job satisfaction

1 Introduction

Corporate social responsibility defines the relation between business and larger society components (Snider et al., 2003; Masa'deh et al., 2013; Obeidat et al., 2017a, b; Abu Zayyad et al., 2020). It also discusses the delivery of shareholder's value and

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_70

promoting for the societal value. Hopkins (2003) put the most appealing definition forward for corporate social responsibility (CSR):

"CSR is concerned with treating the stakeholders of the firm ethically or in a socially responsible manner. Stakeholders exist both within a firm and outside. The aim of social responsibility is to create higher and higher standards of living, while preserving the profitability of the corporation, for its stakeholders both within and outside the corporation". Also, Chuck Robbins, CEO Cisco stated:

> As I reflect on the progress we made in fiscal year 2017, I've never been more certain that what is good for people, society, and the planet is good for business.

Employees are considered one of the primary stakeholders in any company, who are directly responsible for the success and development of the company (Aldalahmeh et al., 2018; Bauman & Skitka, 2012; Masa'deh et al., 2016; Shannak et al., 2012). Generally, being unhappy and unsatisfied at work will be reflected on the employee's personal and daily life (Schultz & Schultz, 2010; Abualoush et al., 2018a, b; Masa'deh et al., 2018; Abuhashesh et al., 2019). Hence, one of the most vital responsibilities of a company is to satisfy their employees by using both financial and non-financial incentives (Tsourela et al., 2008).

This paper is designed to review and explore the related literature in order to form a comprehensive understanding of internal corporate social responsibility and job satisfaction. Hence, the paper discusses the concepts of internal corporate social responsibility, job satisfaction and their dimensions.

2 Literature Review

2.1 Corporate Social Responsibilities

The concept of corporate social responsibility has been a very popular topic in business world and had brought many improvements to it, especially in the cases related to the environment, discrimination and abuse at workplace. The financial responsibility has been the sole bottom line driving force for the success of any organization. The corporate responsibility is considered as the second most important factor contributing to the company's reputation after the quality of its services and products (Kaufmann & Olaru, 2012). Bowen (1953) asked a vital question which is 'to what extent do the interests of business in the long run merge with the interests of society?'. Projects and external activities of any organization will have effect on the environment and society that the organization resides within. Some of these effects might be beneficial and some of them can be detrimental to it. Hence, in today's business market, companies are being put under a huge pressure to gain public trust and stay competitive in the global market (Jamali, 2007).

The social contract theory was used to explain the relationship between company and the society (Rousseau, 2008). Figure 1 shows the concept of interrelation between any organization and the components of the community.

Fig. 1 Relationship between organization and society (Rousseau, 2008)

Corporate social responsibility is found on both the external and internal domain of any company (Tamm et al., 2010). The external social responsibility is the company's involvement in some types of external social project. On the other hand, internal responsibility involves human resources practices such as training and labor participation (Calveras, 2013), in addition to dealing with all issues that can affect the well-being of the employees (Tamm et al., 2010). The corporate social responsibility (CSR) affects the stakeholders of the company; the external CSR affects the outsider stakeholders who are the consumers of products or services, whereas the internal CSR have a social effect on the internal stakeholders represented by the employees (Alshurideh et al., 2012, 2021; Elfenbein et al., 2012). Both external and internal corporate social responsibilities are linked to the services and products quality (Calveras, 2013; Moh'd et al., 2013).

Dutch social and economic council (DSEC) categorized CSR into three dimensions: profit, people and planet. 'Profit' stands for profit maximization, 'Planet' for ecological quality and 'People' for well-being in and outside the organization. Wood (1991) concluded a framework of CSR that consists of three elements: (1) responsibility principles and the motivators of action and choice; (2) intra organizational responsiveness processes for determining action and choice; and (3) resulting outcomes of action and choice. The next section will discuss in more details the internal corporate social responsibility and its impact on corporations. Furthermore, the I-CSR's dimensions and measurements will be reviewed.

2.2 Internal Corporate Social Responsibility

2.2.1 Overview of Internal Corporate Social Responsibility

Three approaches can define the corporate social responsibility: the shareholder approach, the stakeholder approach, and the social approach. The shareholder approach focuses on maximizing the profit of the company, whereas the stakeholder approach focuses on satisfying the interests of the stakeholder that can be affected by the operational activities. Finally, the societal approach suggests that as an integral part of society, companies should undertake responsibilities to the society as a whole (ELSamen & Alshurideh, 2012; Nasrullah & Rahim, 2014; Alshurideh et al., 2015; Al Mehrez et al., 2020a, b).

Previous studies found that the relation between companies and society is complex as it involves the community, employees, governments and even other companies (Cavazotte & Chang, 2016). Internal corporate social responsibility (I-CSR) has got a great attention and attraction for researcher worldwide and from different industries (Ismail, 2011), where all business leaders, government officials and academics are focusing more and more on the concept of I-CSR due to its importance (Reinhardt et al., 2008). Many companies consider CSR as a strategy employed to achieve competitive advantage (Lee et al., 2013). Employees are considered as primary stakeholders, they have a high power to influence the firm, and they are another source of stakeholder demand for CSR (Mcwilliams & Siegel, 2001).

2.2.2 Impact of Internal Corporate Social Responsibility on Companies

Two studies by Aguilera et al. (2007), Heslin and Ochoa (2008) showed that I-CSR has a positive effect on turn over, recruitment, satisfaction, retention, loyalty and commitment of employees. Hence, that will be reflected on the performance and productivity of the employees to work harder and adapt the company's policies and strategies to increase the profit of the company (Hoskins, 2005). It also provides the employees with skills that allow them to be more sensitive toward the problems around them and deal with this problem in a way that serve the company and increase the financial reward. Furthermore, others suggested that CSR should be considered as an ethical behavior, and cares for the environment. Community involvement leads to organizational morality that leads to commitment and satisfaction between the employees. Recent studies showed that adapting the concepts of I-CSR is an effective method to motivate employees (Skudiene & Auruskevicine, 2012). Internal corporate social responsibility (I-CSR) refers to how firms respond to their responsibilities concerning their employees, and the work relation sphere (Cavazotte & Chang, 2016). It focusses on employees more directly and addresses their specific needs (Aguilera et al., 2007).

Pietersz (2011) referred to I-CSR as anything done inside the organization to improve the life of its employees that affect their productivity and it is directly

reflected on the profitability of the company. It also affects the physical and psychological working environment of employees. I-CSR gives the company good reputation and promote the positive image for the employee which make them more satisfied and committed to the organization and improve the results and productivity of their work (Cavazotte & Chang, 2016). Moreover, Yousaf et al. (2016) mentioned that the most valuable benefit behind I-CSR is achieving a higher level of employee's job satisfaction and work engagement. The successful performance of any organization depends on a fully satisfied and engaged workforce (Santoso, 2014). Keraita et al. (2013) indicates that it is very important to have loyal employees for the success and stability in the business world. Therefore, investments in I-CSR encourage competent employees to stay with the company (Cooper & Wagman, 2009). This leads to retention of knowledge between the employees who are considered as an important asset for the development of the company and in reducing turnover cost (Kacmar et al., 2006).

2.2.3 Measurements of Internal Corporate Social Responsibility

Previous studies in the literature investigated various dimensions to measure the internal corporate social responsibility. Thang and Fassin (2017) stated that I-CSR comprises five components: labor relations, work life balance, social dialogue, health and safety, and training and development. Shibeika (2015) mentioned that I-CSR based on stakeholder theory is divided into eight dimensions: training and career development, health and safety, employees' rights, employees' welfare, vacation entitlement, social work environment, workplace diversity and disabled support. Calveras (2013) categorized I-CSR into labor stability, employee participation, and high commitment human resource practices such as training and high wages. Others categorize internal corporate social responsibility to work life balance, training and education, health and safety, human rights and workplace diversity. According to Longo et al. (2005), internal CSR can be classified to four categories: value classes' which include social equity, health and safety at workplace, well-being and satisfaction of the worker and quality of work.

Yousaf et al. (2016) focused on training and education, health and safety and human rights as the three components of I-CSR. Mory et al. (2015) stated that internal CSR comprises seven components derived based on social exchange theory: employment stability, working environment, skills development, work life balance, empowerment, workface diversity and tangible employee involvement. For the purpose of this study and incompatible with how the employees are being affected in pharmaceutical market in Jordan, the dimensions which were chosen to measure the I-CSR are: the skills development, working environment, employment stability, work life balance and empowerment.

Skills Development

Knowledge and skills development are considered the driving forces of economic growth and social development for any country. Countries with higher and better levels of skilled human capital are more likely to respond to the challenges facing it and having a better chance to benefits form the opportunities of globalization compared to the countries with low skilled workforce and employees (Planning Commission, 2007).

Skill development can be defined as all the efforts that allow somebody to learn to do something better than before or do something new that has not been done before. Mory et al. (2015) defines skills developments as to which extent the employees' skills are promoted within the organization. Due to globalization, skills development becomes an essential part of employee's life to meet the new demand of changing economic and new technology (Kawar, 2001; Tarhini et al., 2017). According to Bayley (2015), skills development is focusing on two different segments: education and vocational training. Good education and training can enhance people's capacities and creativity, empower people, raise productivity of workers, and contribute to boost future innovation. Some studies for European countries show that a one percent increase in training days leads to a three percent increase in productivity. Education and development have been associated with positive organizational outcomes such as performance and it promote greater level of efficiency through learning new skills used in the work place (Barney, 2000; Ferraz & Gallardo- Vázquez, 2016).

Trainings offer the employees the opportunity to learn new concepts and gain highly required skills. When these skills and concepts are put into practice, the outcomes from their work will be more qualified and their productivity will increase (Joyce & Showers, 2002).

Working Environment

Mory et al. (2015) refers the working conditions to the health and safety status at work place. Most countries have legislations to protect workers from hazards and accidents at work (Frick et al., 2000). The workplace environment is part of a collective perception that directly contribute to satisfaction and performance of employees (Davis & Newstrom, 1999). According to Terry Irwin the TCII strategic and Management consultant, a healthy work environment can be achieved when maintaining these three aspects: the ethics and value foundation upon which the organization rests, the policies that take those principles and convert them into day-to-day actions and the corporeal environment in which people work.

Some researchers indicate that workplace must be safe in order to reduce the accidents that have negative impact on employee's health. Health and safety practices should be effective and efficient to influence employee satisfaction positively and attract them to work for a longer time in the organization. Good working conditions can reduce any work-related illness and disease that can occur inside the organization. Most of the organizations care about health and safety because that will prevent the

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legal and financial issues associated with any accidents that might occur during the working hours (Hughes & Ferrett, 2011).

There is a strong relationship between improving health and safety and the satisfaction of the employees. Mostly, job satisfaction can be described as the extent to which the working environment meets the need and values of employees. Some researchers found a strong relationship between good working conditions at the organization and corporate social performance. Health and safety are considered a legal compliance leads to competitive advantage and world class business performance. Furthermore, health and safety have a strong relationship with intangible issue such as reputation, brand name, morale and customer satisfaction (Smallman & John, 2001).

Employment Stability

Employment stability is what the company can provide for the employees regarding job security. It must provide comfort, support, security and stability for the employees regarding their jobs (Mory et al., 2015). When providing employment stability, employees will be more flexible about their work roles, more involved in their jobs and more committed to the success of the organization (Al Kurdi et al., 2020; Gerhart, 1991). Lin and Wei (2006) focused on employment security and mentioned it as one of the most vital issues in the present time. Moreover, there is a strong positive relationship between job security and job satisfaction and with the commitment of the employees (Jandaghi et al., 2011).

The majority of companies are focusing on motivating their employees, to make them work hard and to be loyal to the company. Hence, they are offering the employees a job security as a part of their plans in motivating them to invest more time and effort (Leung, 2009).

Work Life Balance

'An employee must live two separate lives, one at work, and the second at home' (Lyness & Judiesch, 2014). Work life balance first appeared in 1986 (Byrne, 2005). Mory et al. (2015) explained that the balance in working life offered by the company could be achieved when there is no conflict between employee's family life and work. They measure this dimension as the time you spend in work compared to time spent in doing something you enjoy. Many companies have been helping their employees to balance between the demand of work and their personal life knowing that this will be reflected on their satisfaction and eventually on the company's plans and goals (Agha et al, 2021; Grady et al., 2008).

Welford (2008) considered the work life balance as an essential part of corporate social responsibility. Work in general causes stress and burnout for workers, which affects the performance and the ability to perform all tasks efficiently. Therefore, being able to balance between work and personal life is so important for individuals

to relax and recharge. Companies that care about work life balance have a great ability in attracting and maintaining qualified and highly skilled employees.

Work life balance can be achieved by creating an internal culture that minimize negative norms and designing policies that support this issue such as flexible work hours, paid maternity leave, leave and time off, health assistance and vacations. Lazar et al. (2010) mentioned that work life balance could increase the participation of female personnel and make use of their capacities and capabilities. In order to keep the employees motivated and maintain an effective performance, the organization should include and work on the concept of work life balance in their corporate social responsibility strategy and plans.

Empowerment

Focusing on the empowerment concept as a part of the internal corporate social responsibility came after the huge escalation noticed in global competition and after facing a strong resistance for the change and the raise in the need for innovation (Drucker, 1988; Obeidat et al., 2019). Bowen and Lawler (1992) define the empowerment as sharing information with front line employees to enable them to understand the organization and act toward improving the performance of the company.

Empowerment can be classified into three categories: structural, motivational and leadership (Menon, 2001; Al Khayyal et al., 2020a). Employees' empowerment strengthens the self-efficacy and confidence to accomplish their tasks (Bettayeb et al., 2020; Ugboro & Obeng, 2000). Empowerment also increases the self-esteem of individuals, which is reflected positively on the performance of the employees and the organization (Spreitzer, 1995).

2.3 Job Satisfaction

2.3.1 Definition of Job Satisfaction

Some scholars defined the job satisfaction as the series of action and attitudes arise from emotional state of the employees towards their job experience and work environment. Moreover, job satisfaction reflects the feelings of the employees during doing their duties and responsibilities (Ardakani et al., 2013).

2.3.2 Impact of Job Satisfaction on Companies

As identified by Tewksbury and Higgins (2006), satisfied employees have a positive attitude toward their job with grater motivation and increased job performance. According to Suher et al., job satisfaction can affect the decision-making of employees regarding whether to leave the job and search for a new company or to

stay at the same position in the same company. The idea of leaving the job will no longer exists if the HR department gives the employees the opportunity to achieve personal development, reward them, evaluate their performance and provide them with environment to express themselves freely (Alshurideh, 2022; Alshurideh et al., 2022). Organizations with satisfied employees have low turnover rate. In addition, satisfied employees are easy to retain in the organization, therefore the organization is able to cut hiring cost of new employees (Cho et al., 2009; Alshraideh et al., 2017; Aburayya et al., 2020a; Kurdi et al., 2020; Hayajneh et al., 2021; Sultan et al., 2021).

The job satisfaction degree can be measured by identifying the extent to which the needs and desires of employees are meeting their expectations. In recent years, achieving a high level of job satisfaction has been an important issue facing many companies (Kusku, 2001). Job satisfaction is an indicator of organizational effectiveness (Rothmann & Coetzer, 2002). Funmilola (2013) stated that organization with satisfied employees are more productive and effective than those with dissatisfied workers, it also reduces employee's turnover and enhance the job performance. Job satisfaction is the fundamental block that leads to recognition, income, promotion and achievement of other goals that leads to the feeling of fulfilment (Kaliski, 2007).

2.3.3 Measurements of Job Satisfaction

Regarding the measurement and types of job satisfaction, many classifications have been proposed over the years. Nash (1985) mentioned that promotions, salary, work environment, work group and work conditions are factors that highly affect the job satisfaction. Lee et al. (2012) figured four types of satisfaction: social such as occupational prestige, organizational reputation and corporate social responsibility, job itself, job environment and organizational characteristic. According to Funmilola (2013), pay, promotion, supervision, work itself and working condition are the dominating dimensions of job satisfaction. Moreover, Manafi et al. (2012) proposed that there are seven types of job satisfaction: workload, perceived control, reward system and recognition, sense of community and social support, perceived fairness on the job and conflicting values.

Some researchers argued that job satisfaction is considered as a bi-dimensional concept classified to intrinsic side that depends on individual characteristic of the person and extrinsic side that depends on environment such as salary and promotion. Herzberg (1966) in his Two-factor theory classified the job satisfaction into intrinsic and extrinsic dimensions, he explained the relationship between these factors and showed how they can increase the effective commitment of employees to their company and decreased their intention to quit. Figure 2 shows Herzberg model explaining the relationship between these factors.

Also, two types of job satisfaction are being studied by researchers: the intrinsic and extrinsic in accordance to the studies provided by Olorunsola (2012) and Herzberg (1966).

Fig. 2 Relationship between job satisfaction and the intrinsic and extrinsic factors (Herzberg, 1966)

Intrinsic Job Satisfaction

Intrinsic job satisfaction is a pivotal in job behavior (Decker et al., 2009). It refers to employees feeling about their job. Many factors can contribute in evaluating the intrinsic job satisfaction such as moral values, creativity, achievement, power and independence (Abdallah et al., 2017; Al-Dmour et al., 2021; Alzoubi et al., 2020). Herzberg (1966) defined the intrinsic factors as motivating factors that are dealing with achievement, recognition, responsibility, advancement, growth, and the work itself. Intrinsic job components are focusing on the idea of using personnel abilities, job participation, job involvement, and have the feeling of accomplishment (Yang, 2009). According to Herzberg (1966) intrinsic job satisfaction factors were described as motivating factors. In 20% of the cases, the presence of these factors leads to satisfied individuals. The motivation factors are comprised of the physiological need for growth, recognition, achievement, advancement, the job itself, and responsibility.

Extrinsic factors such as managerial behavior and the reward system in the work place affect intrinsic motivation (Deci et al., 1999). In other words, their absence was not necessarily dissatisfying, but when present, they could be a very effective motivational force (Herzberg, 1966).

Extrinsic Job Satisfaction

Extrinsic job satisfaction reflects the satisfaction of employee regarding the work tasks or the work itself (Abdallah et al., 2017; Ammari et al., 2017; Al Shebli et al., 2021; Harahsheh et al., 2021). It can be achieved by providing a positive supervision behavior, and paying the employee their benefits suitable with their work load and tasks (Decker et al., 2009). Extrinsic job satisfaction is considering the need of adequate remuneration, opportunity for advancement, and being praised for

doing a good job (Yang, 2009). It can be related to "how employees feel about the portion of the work situation that is external to the work tasks or the work itself". Extrinsic satisfaction is usually influenced by environmental factors that are correlated with the work environment (Abdallah et al., 2017, p.32). Extrinsic factors show less impact on job satisfaction than the intrinsic ones. However, their absence may create dissatisfaction in the work environment (Baylor, 2010).

3 Conclusion

Recently, most of the researchers are trying to study and focus on internal corporate social responsibility as an essential factor for enhancing the employees' job satisfaction (Mory et al., 2015). The interest in internal corporate social responsibility first stemmed from questing to build strong company-employee relationship in order to achieve better level of employee engagement, which will be reflected on the organizational performance and strengthening its position in the competitive market and its reputation in the community. Internal CSR plays a vital role in increasing the productivity of the employees, it keeps them motivated to continuously achieve improvements in the quality of the product and it contributes to the research and development and the innovation in the organization (Hunaiti et al., 2009; Tarhini et al., 2015; Alshurideh et al., 2017; Abdallah et al., 2017; Alshurideh et al., 2019; Al-Khayyal et al., 2020b; Aburayya et al., 2020b; Alameeri et al., 2021; Nuseir et al., 2021).

Employees in any organization are considered the most valuable assets. Hence, it is important to keep all employees satisfied in order to increase their productivity and maintain them motivated. Many companies have been helping their employees to balance between the demand of work and their personal life knowing that this will be reflected on their satisfaction and eventually on the company's plans and goals (Grady et al., 2008).

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Can Better Capabilities Lead to Better Project and Program Governance? Cases from Dubai

Mounir El Khatib, Fatma Beshwari, Maryam Beshwari, Ayesha Beshwari, Haitham M. Alzoubi, and Muhammad Alshurideh

Abstract This paper addresses how to improve project and program governance through improving process and infrastructure, resources and stakeholders, organization and culture, and leadership and decision making. A brief overview of the theoretical background of these four governance capabilities is presented. The research approach is described along with three case studies from local government entities in the UAE have been analyzed. The data collected revealed that there is a gap in project/program governance implementation within the chosen organizations for this study. The paper suggested some approaches to improve the four capabilities that can contribute to creating and enhancing the current governance structure utilized across the organizations for achieving better project execution and program benefit outcomes.

Keywords Project management · Program management · Governance · Capabilities · UAE

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_71

1 Introduction

Program Management is a rapidly emerging profession fulfilling a key need to be used in establishing companies both big and small. Program management can be defined as the integration of skills, knowledge, techniques, and tools to meet program objectives (Project Management Institute, 2016). The programs are used to either better manage costs, maintain overall conditions, and successfully controls over conflicts. The program management generates value through linking different groups within an organization around common processes and goals. Therefore, there has been a strong interest in business market toward establishing project and program governance (Alaali et al., 2021; AlShamsi et al., 2021). The development and implementation of program governance are essential keys for project/program managers on how to manage a successful program (Al Alshurideh, 2019; Batayneh et al., 2021). This is because organizations are facing a huge problem when it comes to managing several projects, especially if they were across the geographies without having a formal program structure (Kabrilyants et al., 2021; Odeh et al., 2021). This made top management find difficulties in monitoring and controlling various projects execution in the absence of proper governance structure and formal channels. This leads to create a disconnection between project execution and organization strategies as well as no primary body like Steering Committee to provide oversights to programs and its components. Other challenges noticed with implementing an effective program governance are inadequately executive support, globalization, and rapid change in technology and business environment (Hasan et al., 2022; Project Management Institute, 2016; Tariq et al., 2022). The problem that many program managers has struggled with is how to determine making the program governance framework adaptable to different program requirements. Therefore, the aim of this paper is to address how to improve project/program governance through improving four capabilities which are process and infrastructure, resources and stakeholders, organization culture, and leadership and decision making.

2 Literature Review

2.1 Concept of Governance

According to Klakegg, the term "governance" is closely linked to words like governing, government, and control (Klakegg et al., 2008). In organizational settings, governance offers the necessary structure based on definite roles, accountability, and transparency for managerial actions and ethical decision-making within an organization (Müller, 2009). According to literatures, there are mainly two schools of thought about governance. The first school of thought postulated that different subunits of an organization require different forms of governance, such as project governance

(Abednego & Ogunlana, 2006; Miller & Hobbs, 2005; Winch, 2001), public governance (Du & Yin, 2010; Klakegg et al., 2008; Williams et al., 2010;), network governance, knowledge governance (Ghosh et al., 2012; Pemsel et al., 2016), and IT governance (Marnewick & Labuschagne, 2009; Martin & Gregor, 2006; Willson & Pollard, 2009). This school of thought about governance is likely developed by project managers, IT managers, government officials, and academics who work exclusively within these disciplines (Guergov & Radwan, 2021; Hamadneh et al., 2021; Obaid, 2021). Proponents of this school of thought viewed governance as a function of any entity or management responsible for decision making and/or overseeing the operations and projects of the organization. They also hold that there is no integrated governance practice as all governance practices operate independently from one another.

The second school of thought was proposed by organizations like agencies that govern stock exchanges, various Institutes of Directors (Institute of Directors Southern Africa and Australian Institute of Company Directors), and the OECD. According to this school of thought, governance is a single process but has different phases, which include viability and sustainability, financial governance, governing the people within the organization, governing changes, governing relationships, and the performance of individual directors and the Board of Directors. This school of thought holds that the core values of a well-governed organization include its vision, values and ethics, commitment to corporate social responsibility (CSR) and the way the board governs itself. While these core values are not absolute, they should exclusively be the responsibility of the organization's governing board or its equivalent.

2.2 Project Governance

Project governance has been explored by several practitioners and academicians (Abednego & Ogunlana, 2006; Sankaran et al., 2007; Yin et al., 2008). Project governance is a subset of corporate governance and focuses on the areas of corporate governance that relate to project activities, such as project and program disclosure and reporting, project and program management and efficiency, project sponsorship, and portfolio direction (Garland, 2009). Project governance has been around for several years and is the tool necessary to deliver strong and accurate project analysis. According to literatures, project governance is a general term used to encompass leadership, authority, direction and control, accountability, and stewardship to accomplish a project (Akhtar et al., 2021; Cruz, 2021; Khan, 2021). Project governance, especially at the pre-stage of a project procurement is very important to determine the success of any particular project. Project governance provides the right framework through which the goals and objectives of organizational projects are set. It also provides the structure though which achieving those goals and objectives are determined, and how monitoring project performance are determined (Australian Government, 2017). The essence of project governance is to ensure that project goals

and objectives perfectly align with the organization objective and portfolio (Alzoubi et al., 2022; Aziz & Aftab, 2021; Mehmood, 2021). Hence, project governance has three main goals, which are selecting the right project, delivering the selected project effectively and efficiently, and ensuring that the selected projects can be sustained. Project governance helps in outlining the relationships between internal and external individuals involved in delivering a project, which include the project stakeholders.

2.3 Organizational Responsibility for Project Governance

As stated above, project governance is the process and framework that ensures that organizations properly set up their resources and investments to ensure that the resulting project delivery is carried out properly and as desired. Generally, project governance is implemented at different levels of the organization. For instance, project leaders receive directions from and report back to their project managers, project managers receive direction from and report back to the executive, and the executive to their director or board of directors. According to Selig (2008), effective project governance is built on three key elements, which are:

i. Leadership, organization and decision rights.
ii. Importance of flexible and scalable processes improvement; and
iii. The use of enabling technology.

Project governance starts with setting clear goals and objectives for the organization to provide the initial directions. After clear goals and objectives have been set, then strategic planning and execution of the goals and objectives ensue. The implementation of the project governance action plan, policy, and strategy will ensure that the project governance is effectively. Afterwards, a continuous loop is established to measure the project performance and compare it to the set goals and objectives of the project. This may lead to the redirection of project-related activities or changes to goals and objectives where appropriate.

2.4 Project/Program Governance Overview

Governance impacts every organization no matter how big or small, public, or private it is. So, understanding governance is an important factor to the organization because appropriate governance results in the success or failure of strategic initiatives (Project Management Institute, 2016). Program Governance can be defined as what a program is supposed to accomplish, describe how to keep the program on track, and detail how the organization can provide support. Project/program governance contains all key elements that lead to execute a successful project or program. It is important to adapt these key elements to the needs of the organization as project/program governance needs to be aligned with the business' governance (Ali et al., 2022; Alshurideh

et al., 2022; Ben-Abdallah et al., 2022). When program governance framework well designed, it will provide good practices for effective decision-making and managing the program appropriately. Program governance support creating an environment for better communication and addressing program risks, uncertainties and opportunities that occur during the program performance. It assures stakeholder engagement by establishing clear expectations for program interaction and designing, authorizing the assurance when it is required by reviewing and health checks of program delivery (Project Management Institute, 2016).

Governance capabilities is the ability of providing an efficient form of governance for the organization to gain competitive advantages and to initiate, maintain its relationship with another organization (Doğru, 2019). The purpose of governance capabilities is to allow and assure the ability to control business, process, IT system capabilities and services offering of the enterprise with an acceptable limit that set by the organization.

2.5 Process and Infrastructure

The process in governance can be defined as how an organization consolidates their management, tasks, and services in order to ensure that project or program is executed properly based on the expectation of managers and stakeholders (Alsharari, 2021; Hanaysha et al., 2021a, b; Lee & Ahmed, 2021). Applying governance can make it possible by implementing standardized practices, process, and rules across the project. To get the successful performance in process, it is very important to establish process office, test process before mandating, defining team members, documentation, risk management and communication.

Infrastructure in program governance is a backbone for achieving a long-term inclusive development. Governance of infrastructure includes a range of tools, process, decision-making and monitoring by the organization. The Program Management Office (PMO) is part of the infrastructure governance and provides support along administrative, process, financial, and staff dimensions correlate with successful program implementation. In addition, Program Management Information System (PMIS) is another component of infrastructure governance which should play a critical role in integrating between all activities, phases and systems utilized with program execution (Alshurideh et al., 2020a; Ashal et al., 2021; Kurdi et al., 2021). Therefore, organizations tend to follow the latest technology such as, blockchain and big data to enhance their infrastructure governance's system. According to Risius and Spohrer (2017), blockchain technology is used as a tool to improve the project management success factor like monitoring, communication, traceability, and scalability.

2.6 Resources and Stakeholders

Stakeholders is individual or group that has interests in decision or activity in the organization and they can be an internal or external stakeholder (ASQ, 2020). Stakeholder can be people who are invested in the project or program and who will be affected at any phases along the way (Alhamad et al., 2021; Rui et al., 2022; Shakhour et al., 2021). In addition, their input can be directly impacted on the outcome of the project. It is very important to communicate with them in order to collaborate on the project (Rafiee & Sarabdeen, 2012). Good governance can influence taking the cooperation of stakeholder into account with the concentrating on interests of a wide range of constituencies as well as assuring rapid access to information and good communication with stakeholder which leads to better results. Resource on the other hand, it is all necessary asset that is utilized to carry out certain tasks or a project and it can be person, tool, team, finance. In addition, it is very important to allocate resources before starting the project or the program (Ghazal et al., 2021). Good governance framework is encouraging the efficient use of resources and equally distribute the accountability.

2.7 Organization and Culture

Governance and organization should work together on aligning strategies, objective, and risk tolerance. In addition, they can help in clear defining of roles, accountabilities, and empowering risk management (Ali et al., 2021; Alshurideh et al., 2021). Governance and the organization contribute to identify and promote all related matters across the organization such as centralized and decentralized model, the role of leadership and how to make decision making (Al-Dhuhouri et al., 2021; AlShehhi et al., 2021). Organizational structure is the outline how certain activities are directed to meet organization goals (Alshurideh et al., 2017; Murray & Christison, 2012). A poor governance structure will leave project/program in a continuous reactive state which lead to difficulty in catch up with changing conditions.

Culture represents organization personality and it compromised of assumptions, belief, value, norm, and organization team member behavior (Abuhashesh et al., 2021; Hamadneh & Al Kurdi, 2021). Understanding the culture of the organization is critical to run a successful project/program (Al-bawaia et al., 2022; Alzoubi et al., 2020). Culture can influence the organization policies through the value held by the decision maker. Moreover, culture contributes to the interpersonal relationship of the individual and the organization relationship which is leading to change a choice of governance structure (Alzoubi & Aziz, 2021). Several elements of the organization structure and culture has effects on how project/program managed. Therefore, it is important to identify them to help in creating organizational culture that incorporates project/program management (Rafiee & Sarabdeen, 2012).

2.8 Leadership and Decision Making

Leadership in project is the act of team toward successful completion of project/program. In fact, leadership requires skill in both leadership and management. Many studies and literature found that there is a significant impact between leadership and governance (Alzoubi et al., 2021). Governance plays an important role in providing planned direction for leaders and help them to foster commitment, accountability, and shared aims. In addition, governance supports leadership in project/program through arrangement and frameworks. Also, governance provides important boundaries for leadership in the project/program (Lord et al., 2009).

Decision making in project/program is on a daily basis and can lead to success or fail of the project/program. Engagement of governance in project/program can set the boundaries within people operate. In addition, it identifies who is responsible for decision making and define the process that should use to make legitimate decisions (Hanford, 2005).

2.9 Challenges of Program Management Capabilities Development

Despite the good potentials of program management capabilities, program management has been facing a failure also in the government sector (ALnuaimi et al., 2020). This issue has been studied for several years and many studies addressed that program management in the context of efforts to improve certain organization. A study has been conducted by Council for Excellence in US government in 2008, identified five major challenges of program management capability development across government sector (Alzoubi et al., 2020). First, policies have been developed overtimes to address a specific issue and do not holistically address the challenges of program management. Second, program management is not recognized as a management discipline that is essential to organization success, performance and results. Third, stakeholder and agency executive do not understand their responsibilities and roles (Joghee et al., 2020). Fourth, no consistency in government sector for training and development a program manager. Finally, the program manager is lacking professional community within the government organization as many program management roles in the organization are working in relative isolation (Marshall et al., 2015).

3 Research Methods

This is a conceptual paper that purposes to use case studies to address how to improve project/program governance through improving capabilities specifically Process and Infrastructure, Resources and Stakeholders, Organization and Culture, and Leadership and Decision Making. Three case studies are reviewed: two from Dubai Government entities and one of the Federal Government entities. A combination of primary and secondary data has been utilized to gather the information (Alshurideh et al., 2020b). Mainly an interview was used as primary data and.gov,.org, and official organization press used as secondary data. The interviews have been done through virtual meetings and they were based on open ended structure.

3.1 Data Collection

3.1.1 Case A: Dubai Electricity & Water Authority (DEWA)

DEWA is one of the big government entities in Dubai Government that provides utility services specifically water and electricity services. DEWA considers governance as a foundation of its operation since its establishment. Good implementation of governance in DEWA starts with the top management and leadership being an example. Organization structure, control system, and operation driven by policies and documented processes have led to greater efficiency and productivity, which is a good achievement for the world governance culture (Alzoubi & Yanamandra, 2020). DEWA program governance focus is to provide active direction, periodically review the results, identify and adjustments to ensure achievements of the planned outcome that contributes to the success of the overall business strategies.

The project framework covers the classic components of governance such as board oversights, a clear organization chart and span of control, and a well-documented strategy and proper delegation of financial and administrative authorities (Lee et al., 2022b). In keeping with international guidelines, DEWA adopts the three lines of defense approach with management and supervision being the first line, risk legal compliance governance being the second line, and internal audit as third line. A board base control review system is enabled through external auditors and the government audit. DEWA organizational model decomposes all management and oversight functions and describe the relation among them.

3.1.2 Case B: Dubai Municipality (DM)

DM is one of the biggest government's institutions in Dubai and one of those institutes who are leading the development of smart services. DM has a PMO that is reported directly to the director general office in the organizational hierarchy. PMO is responsible for defining and maintaining projects executions through adapting PMI methodology (Mehmood et al., 2019). Since 2009, DM has established governance by identifying and issuing general framework and manuals based on enhanced guidance and control, filling the right, relations, and obligations.

DM Project Governance framework provides a comprehensive application of regulations, procedures, and laws as well as it is a sharing process that involve stakeholders and through which vision and missions are achieved. It includes a network of organizational relationships that gives integrated system which contributes to finishing tasks and works professionally. In addition, Program Governance framework defines management principles and decision-making hierarchy (Alzoubi et al., 2019). A unified portal called PMWeb has been used as PMIS assigned to each department to allow project managers to monitor and control activities within project (Asem Alzoubi, 2021a, 2021a, b; Eli, 2021).

3.1.3 Case C: Ministry of Climate Change and Environment (MOCCAE)

MOCCAE is one of the federal authorities that was established in February 2006 as the Ministry of Environment and Water. In 2016, the UAE Cabinet reshuffle the Ministry and subsequent integration of the climate change function, as well to changing the name to the Ministry of Climate Change and Environment (Alzoubi & Ahmed, 2019). MOCCAE aims to strengthen the UAE's efforts in preserving the environment and promoting food diversity on the national level (Miller, 2021).

MOCCAE has recently adopted organizational governance based on the new decision of the UAE Cabinet on the Governance System for the Federal Government Boards (2020). The decision was made after the COVID-19 pandemic. However, MOCCAE had started in project governance in the late 2018. It is considered as a reform for the organization and a key element to maintain the sustainability of projects and initiatives (Alnazer et al., 2017). It is a technique and infrastructure that helps in adapting to different challenges that might occur in the future.

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4 Data Analysis

Program governance capabilities	Case A	Case B	Case C
Process and Infrastructure	– Well-structured as project governance – Unclear about program governance – SAP PPM as PMIS	– Well-structured as project governance – Newly introduced program governance – PMWeb as PMIS	– Newly introduced project governance – Unclear about program governance – No PMIS and mainly rely on Basic MS office
Resources and Stakeholders	– Well defined resources allocations and utilization – Lack of external stakeholder involvement	– Well defined resources allocations and utilization – Lack of external stakeholder involvement	– Traditional methods in allocating resources and estimations – Traditional methods followed to identify and involve internal and external stakeholders
Organization and Culture	– Methods are communicated across organization – Regular awareness	– Familiar with projects knowledge – Regular awareness	– Unclear project culture
Leadership and Decision Making	– Automated process – Clear direction and involvement of leadership	– Programs are linked to strategy – Automated decision-making process	– Not structured decision-making process

4.1 Case A: DEWA

DEWA has a well-structured project governance, but the concept of program governance is not clear to them. Programs are considered as big projects and follows project governance framework that in some cases could not be tailored to meet the program requirements. This is because project focuses more on product and services executions while programs focus on the benefits which is not included in project governance framework (AlHamad et al., 2022; Lee et al., 2022a; Miller, 2021).

Decision making is based an automated process and follows three levels of approvements review, confirm, and approve in Smart Document Application as well as DEWA uses SAP PPM module as PMIS tool for project management, financial and resource allocations. However, there is lack of consideration of external stakeholders with existing governance framework and it is mainly focused on internal

stakeholders like divisions, departments, and project teams. The main drawbacks found that many of big projects (programs) managers are not qualified enough to manage the execution of such projects where they usually are delayed and required many modifications and change requests due to inaccurate planning. Finally, DEWA organization culture has a shortfall of understanding program governance and its role to differentiate between projects and programs which impact the organization operational performance.

4.2 Case B: DM

Program governance in DM is still a new concept and challenging as well because it requires more efforts to establish well-structured processes with the applicable approval flow. The approval flow must be capable to develop, modify, or reconfirm the business case for the component (Mondol, 2021; Radwan & Farouk, 2021). Moreover, the management in DM has good resources and technologies. They have a PMIS called PMweb which is used for initiation, monitoring, and documenting projects within organization as well as it acts as a centralized source of all projects and programs that can help in successfully meeting the organization strategies. This system provides a cross functional system that combines many departments to work as one team in order to meet the goal and vision of the organization. In addition, top management has clear direction, roles, responsibilities toward stakeholder involvement to assure the success of the program, but there is a lack of external stakeholder involvement. Overall, DM built a professional ecosystem of confidence and credibility by actively promoting culture of governance, but still there are confusion between programs and initiatives.

4.3 Case C: MOCCAE

The ministry has recently adopted project governance. Therefore, there was some limitation in collecting the data and lack of knowledge about program governance. There is no clear approval authority for projects and PMO is still unstructured well. The programs are called initiatives and they have many initiatives that contains many project components, but there is no awareness about the correct terminologies, tools, and system. In addition, MOCCAE does not have a PMIS and mainly rely on basic MS Office documents to create project plans and share the information that create chances of creating human errors and lack of integrity. Moreover, they follow weak approach in stakeholders' identification and involvement that causes delays of the project and program (Al Ali, 2021). The resources estimations and allocation process have many drawbacks and can be biased in some cases because of inappropriate structure followed in this phase. Many of project managers are assigned based on their job roles not specialized in project management which leads to plan the project

inaccurately and results in delaying or failing the project because of many changes are occurring in the scope before and within execution phase.

4.4 Discussion of Results

Establishment of program governance is not an easy task. Indeed, huge investments are needed when it comes to improvement of project/program governance framework. Program governance needs to be tailored to an organization specific need and there are four major components that have been identified can influence how effectively implement and improve project and program governance.

4.4.1 Process and Infrastructure

Organizations must establish strategies and support infrastructure with the vision and their capabilities. PgMO must be established since it is a core part of the program infrastructure and it supports the management and coordination of the program and component work. In addition, PMIS another key aspect that must be focused on because it is used for collecting, integrating, and communicating information (Alzoubi, 2021a, 2021a, b; Farouk, 2021). It should incorporate change management system, risk database, financial management system, earned value management system, configuration management tool, and knowledge repositories. The infrastructure should be optimized, transparent, and capable in managing complexity which will help in managing the project/program more efficiently and confidently. That is why, new technologies such as blockchain and AI can be utilized to enhance the tools and skills. In addition, it will make the organization more proactive through identifying, diagnosing, and resolve performance problem before they negatively impact the business (Al Alhashmi et al., 2020; Shebli et al., 2021; Yousuf et al., 2021).

The organizations need to introduce Business Process Management (BPM) that must focus on redesigning the current processes. With BPM, organization get the flexibility of making changes to processes with minimal costs and can easily be customized to suit the requirements of the organization (Kashif et al., 2021). In addition, BPM can simplify the automation of repetitive steps with regular workflow such as elimination of redundant steps, removal of bottlenecks and introduction of parallel processing. This will result in creating a sustainable profitability and growth.

4.4.2 Resources and Stakeholders

Governance is provided by the people and processes that guide them directly for the benefit of the organization and all stakeholders. This includes the shareholders, board of directors and executive team. The main aim of governance is to breach the gap between the managers and stakeholders. It is more concerned about the organization

contribution of all the stakeholders. So, the main step for the program manager is to identify the key stakeholders and manage their concerns through providing clear program updates of the findings and ensure the continuous leadership alignment (Harahsheh et al., 2021; Kurikawa & Kaneko, 2016). The capability of the resources, external support, and experience are important aspects to the success of the program. Establishing trackers and reporting tool is one way to disciplined forecasting the resources.

4.4.3 Organization and Culture

The organization and program culture has unique aspects that need to be understood and developed appropriately to be able to match their complexity. Therefore, organizations need to search for the suitable ways to achieve the benefits from the program. Shifting the organization be a dynamic organization is one way that can be followed. Dynamic organization simulates the changes in people, processes, environment, and culture (Alshraideh et al., 2017; Zu'bi et al., 2012). It has the ability to grow the organization with less risk through dynamic strategies and operation reviews which help in removing the obstacle blocks and allows for actions that accelerate the growth (Allozi et al., 2022; Kurikawa & Kaneko, 2016).

4.4.4 Leadership and Decision Making

A critical aspect of program governance is delegated specific decision-making authority to each administrative and management role. Leadership should continuously linkage to enterprise business strategy and direction, provide administrative support and assign an executive control over program evolution and outcomes (Ali et al., 2021; Ghazal et al., 2021). Program managers can hold special group work meeting for this purpose and then establish and allocate a matrix for major decision areas and responsibility (Alameeri et al., 2021; Hanford, 2005). This will create a clear and well understood decision making authority as well as effective oversight of and insight program progress and direction (Ahmad et al., 2021; Ahmed et al., 2021; Alyammahi et al., 2020).

5 Conclusion

In conclusion, establishing an effective program governance framework is an important activity requiring concentration on all capabilities. A strong governance process provides a sustainable foundation for the organization business to support growth for the future (Alhamad et al., 2021; Kurdi et al., 2021). The three case studies analyzed in this paper revealed the need for a proper program governance framework because the program's success relies on best utilization of the governance framework, policies,

and best practices. When governance is built properly, it provides sufficient reporting and control activities. This is because governance empowers program managers to execute their responsibilities in a structured and well-defined workflow. In addition, continuous feedback and communication are necessary components of a program governance and program team members must understand each organization's values (Alzoubi & Aziz, 2021; Alzoubi et al., 2021). For best implementation, organizational structure of each component within the program must be applicable to the enterprise overall management philosophy and methods.

6 Recommendations

- Organizations should establish a clear program governance framework with stakeholder involvements instead of relying on project governance.
- Create a dedicated team for Program Management Office.
- Evaluate several models of successful program governance implementations and adapt most applicable ones.
- Identify the program roles, decision making hierarchy, strategies, and best practices.
- Introduce new technologies such as big data and blockchain to enhance the lesson learned data and program knowledge management to be utilized as a source for future project/programs.

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A Trial to Improve Program Management in Government Bodies Through Focusing on Program Resource Management: Cases from UAE

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Abstract Improving a program management in government bodies is a critical aspect, and this research paper demonstrates a thesis on Program Resource Management and its process to the success of government bodies' roles. The qualitative methodology in this paper studies the program management several aspects in terms of resource management and its effect on the success of the government sector's programs in UAE. The study covers program management's impact on the sectors and issues in government sectors in relation to the lack of professionals and its effect on the availability and clarity of the senior management career paths. The research paper addressed the main problem in program resource management and its wide effects. Similarly, the data gathered to cover the same thesis to compare and analyze the government bodies' key results and finding. The researchers have been addressed the impacts of resource management on the program management in the government sector. Since resources are always allocated and utilized with a proper record being kept in the government sector, this research analyzes the issues in the government sector. It was estimated that the program managers lack a professional community within the federal government that can provide support and a voice on issues affecting the development of program management in the sector. This give rise to several concerns which are need to be addressed and the research will be on providing a solution to this problem. Alongside that, the research pointed out that

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_72

the government-wide job series for program managers that spans business functions with a career path that extends into senior career executive management ranks is full of flaws. There is a lack of credibility and quality at the level of the management which manages the resources. The research also allowed the researchers to carry out the SWOT analysis on program resource management. This will allow to identify the major threats and the opportunities which the field has for the young aspirants in the future. The researchers' main focus is on to identify the major problems in the program resource management. The aim has been to identify these issues and then propose proper and sustainable solutions for them to ensure employees and management make better use of the resources either in the program or project. The issues like managing resource allocations, choosing the right career path and lack of training and development are a few to name which the research has discussed in detail. The aim has been to evaluate these issues by ensuring that they are analyzed from the perspective of the employees as well as the management.

Keywords Project management · Program management · Resource management · Capabilities · Government bodies · UAE

1 Introduction

One of the most continues challenges for several programs across worldwide is maintaining resource management effectively (Alkalha et al., 2012; Alshurideh et al., 2019; Zu'bi et al., 2012). In the program environments, program resource management decides the success or failure of the program. It is very essential and critical that the program manager requires to work within the uncertainty boundary and assure the necessary elements and items for the projects (Al Ali, 2021; AlHamad et al., 2022; AlHamad et al., 2021; Ali et al., 2021). Program resource management plays a vital role in ensuring the availability of the needed resources to the project managers. This will lead to accomplish projects in an approved schedule date and get program benefits.

The researchers listed out the critical success factors to support program resource management. The listing out of CSF has allowed the organizations to significantly be able to identify the key factors responsible for the success of the organization and how the organization should focus on these key factors for sustaining success for long term period. The gaps and the issues in the organizations in terms of the program resource management was done by conducting interviews from the program managers of Emirates Group, Water and Power Producer Companies (IWPP) and The Executive Council of Dubai as a source of data gathering. Each manager made suggestions to improve the capacity and capability for the project and program management. It was suggested that the program manager job series must have a clear career path and policies to support the career development of program managers. The research aimed to solve the problems of the program managers for better resources use and allocation

alongside effective management. This research explored the question under study by getting in touch with the professionals for effective results. At the end, there are a several recommendations for better use of the resources in program management.

On the other hand, program resource management faces several significant challenges, which are an insufficient correlation with the owners of the resource, poor project planning, inadequate HR planning, lack of career path, no consistency in the training of resource management, …etc. (Al Kurdi et al., 2021; Ashal et al., 2021; Shamout et al., 2022).

In this research study, we will discuss the impact of resource management on the success of the program management alongside its issues. The gaps in resource management will be addressed, and solutions will be proposed. Qualitative data is gathered from three different organizations. Then, analyze data based on the literature review and data gathering interviews. Finally, drawing the conclusion and recommendations based on data analysis.

2 Literature Review

2.1 Program Resource Management Definition and Explanation

Program resource management is a very important organizational procedure that should be regulated to ensure that the critical inputs are used accordingly. This concept entails two distinct aspects, which are program and resource management. Programs refer to the projects organized by entities, whether in the private or public sector, to achieve certain goals and objectives (NAPA, 2015). The programs might range from training and development initiatives to the construction of public amenities to serve the local citizens and international corporations operating in the country. On the other hand, resource management refers to the specific strategies instituted by an organization to promote effective and efficient use of the available inputs (Petersen & Kumar, 2015). The practice is prevalent in both private and government agencies, which thrive to promote transparency and accountability in the utilization of core resources (Ali et al., 2022; Alnazer et al., 2017; Alnuaimi et al., 2021; Alsharari, 2021). Based on the breakdown of the constituent elements, program resource management can be defined as the specific initiatives incorporated within an organization, whether government institutions or corporations, to ensure that the resources are utilized effectively and efficiently in the core operations. However, the complexity of the process varies between organizations depending on the nature and the scope of operations. Therefore, it vital for the government organizations to adopt an effective resource management strategy to enhance its output.

2.2 Resource Management Impact on Program Management in the Government Sector

Resource management can be utilized by the government agencies to ensure that the implemented programs are managed effectively to deliver maximum utility to the members of the public. The government organizations and state-owned enterprises, such as agricultural, sports, tourism, and health agencies, are faced with the challenge of allocating the resources efficiently to yield optimal returns to the members of the public (Alshurideh et al., 2020; Alshurideh et al., 2022; Alzoubi, 2021a). The complex system of governance in the government entities renders the structure porous, hence encouraging inefficient use of resources, which includes duplication of core operations and embezzlement of the available funds. As such, the introduction of an effective resource management initiative would significantly combat the above-mentioned constraint and ensure that the government utilized the tax revenue effectively to benefit its citizens.

To start with, through resource allocation, the initiative would enable the government institutions to optimize the use of the available resources. It is vital for the government institutions to identify the resources that contribute to sustainability and allocate them efficiently (Braganza et al., 2017). Resource management enables organizations to organize their available assets, whether human, financial, or physical, to align with the overall goals and objectives of the projects (Patanakul et al., 2016). For example, the government agencies can divide work accordingly so as to match the competence of each individual in the organization. The process would promote effectiveness in operations, hence preventing the common operational inadequacies, which enhance wastages. In order to actualize the process, the managers and leaders in the government organizations should often use resource allocation reports. The documentation provides a detailed overview of resource availability (Scarlett & Boyd, 2015), hence preventing schedule delays or over budgeting. As such, the enhanced reporting capabilities would support transparency and efficiency over the government projects.

In addition, the government organizations can use resource leveling, a common type of resource management technique, to enhance the execution of their projects. The agencies can analyze the current and prior projects to identify the underutilized resources (De Carvalho et al., 2015). Timely identification of the inefficiently used resources would enable the agencies to apply the inputs to their advantage, which will ultimately increase the delivery of public goods to the citizens. For example, the government organizations can utilize the range of internal skills and expertise to acquire certain professional services rather than outsourcing the competency from private institutions. The interior employers within the institutions might have special talents and expertise, such as graphic design, auditing skills, and project evaluation, which could be utilized internally to foster productivity (Ayers, 2015). As such, the action would save some finances, which will be channeled towards other viable projects that would assist the members of the public.

Furthermore, the government institutions can utilize resource forecasting, another resource management practice, to improve the outcomes of their projects. The practice utilizes the historical data and level of current operations to predict the future resource requirements before the commencement of the project. It is a reasonable plan that can be used to optimize people, materials, and budget efficiency (Alzoubi, 2021b; Alzoubi & Yanamandra, 2020; Alzoubi et al., 2020a, b, 2022). At the initial stages of planning, the government institutions, led by the management, will have to identify the scope, potential constraints, and possible contingencies. However, it would be essential for the managers in the government institutions to be familiar with the public project lifecycle and the general overview of the requisite resources within the organization. The management can utilize project management software to provide the required project visibility (Serrador & Turner, 2015; Kabrilyants et al., 2021; Shakhour et al., 2021). The software will also enable the management to centrally access the projects and the corresponding resources. As such, having a comprehensive expectation of the future resource requirements enables the government institutions to plan accordingly, hence promoting efficient resource utilization.

2.2.1 Program Managers Lack a Professional Community Within the Federal Government that Can Provide Support and a Voice on Issues Affecting the Development of Program Management

However, irrespective of the advantages associated with the program resource management techniques mentioned in the prior section, the program managers in the government institutions might lack the requisite support to apply the measures effectively (Alzoubi et al., 2021; Alzoubi & Aziz, 2021; Alzoubi & Ahmed, 2019). Indeed, program managers lack a professional community and backing within the federal government that can provide the necessary support and reinforcement on fundamental issues that affect the development of program management. The government organizations accompanied by poor priority, especially in the government projects, might alienate the program managers and fail to offer the necessary financial, infrastructural, and human support to ensure that the resources are utilized efficiently and effectively. As such, most of the government projects are encompassed with issues of various magnitudes.

2.2.2 A Government-Wide Job Series for Program Managers that Spans Business Functions with a Career Path that Extends into Senior Career Executive Management Ranks

The application of resource management in government programs provides a culture that prioritizes efficiency, which ultimately strengthens career development. Particularly, a government-wide job series for program managers, accompanied by resource management and viable practices, bolsters business function efficiency, hence providing a pathway for career development into senior executive positions

(Alzoubi et al., 2020a, b; Aziz & Aftab, 2021; Cruz, 2021). The application of resource management provisions by the program managers in the government institutions bolsters their reputation greatly due to the high level of productivity. As such, the process creates a path upon which the project managers can elevate into higher managerial positions. As such, it is vital for the personnel within the government organizations with the aspiration of progressing in their careers to adhere to the resource management practices in their projects.

2.3 Program Resource Management SWOT Analysis

SWOT analysis can be used by the project and program managers to identify areas in resource management that need enhancement. The strategic tool enables the project and program managers to bolster program resource management to gain optimal efficiency (Hornstein, 2015). It also enables the leading personnel to mitigate the risks associated with the functions and optimizes the entire program. The constituent quadrants of the SWOT analysis matrix are discussed below.

- **Strengths**

Program resource management has certain strengths that make it appropriate in dealing with government-related projects. To start with, it aligns with the organization's goals and objectives formulated by the program and project managers, which is enhanced productivity. Program resource management ensures that the government organizations use the available resources optimally (Kogan et al., 2017; Rui et al., 2022), therefore bolstering the output. Second, the initiative is universal, hence compatible with different projects within an organization. Precisely, program resource management can be used in any organizational process to promote effective and efficient consumption of resources. Finally, program resource management encourages a culture of creativity and inventiveness, which enables the organizations to join optimal output from the project and program team members. The strengths indicate that the initiative would be appropriate in government organizations (Eli, 2021; Ghazal et al., 2021; Guergov & Radwan, 2021; Hamadneh, Pedersen, & Al Kurdi, 2021a, 2021b).

- **Weaknesses**

Irrespective of the strengths mentioned in the prior section, program resource management is associated with certain deficiencies, which if not addressed, might hamper the effectiveness of the operations set by the program and project managers alongside their team members. To start with, the process is very sensitive and disposed to potential errors, which might lead to further loses. Particularly, the forecasting of resource needs might be affected by environmental uncertainties, which might ultimately lead to either under-allocation or over-allocation of resources (Hanaysha et al. 2021a, b). Second, relying on internal expertise, which is obtained from the project and program team members, would lead to the acquisition of services that

are not entirely professional. The reason is that the internal employees might not be as experienced as the seasoned professionals in various fields, including accounting and project evaluation. Finally, the initiative might be expensive, especially in cases where intensive forecast is required. As such, the weaknesses should be addressed to ensure that program is effective.

- **Opportunities**

Application of program resource management grants the program and project managers plenty of opportunities to flourish in their respective markets. The initiative provides an opportunity for the organizations to expand their investments to other viable projects. Particularly, through cost minimization (wastage reduction), the government organizations, which are steered by the project and program managers, would channel the saved finances to other projects that would yield optimal returns to the citizens. Second, through the government support, especially in relation to oversight, the program managers can plan effectively and acquire sufficient resources to execute the major initiatives (Patanakul et al., 2016). As such, it would be rational for the project managers to implement effective program resource management practices.

- **Threats**

There are some threats that emanate from the external surroundings, which might threaten the success of program resource management. Political instability might interrupt the government organizations operation (Patanakul et al., 2016), hence affecting their resource planning adversely. Furthermore, political realignment, especially in relation to the leadership positions of government organizations, might disorient the implementation of resource management practices. Therefore, it is essential for the government organizations to formulate viable corrective management practices to deal with the uncertainties.

2.4 Main Problem in Program Resource Management

2.4.1 Managing Resource Allocation

The project management resources require the organization to adopt the right set of procedures, techniques and philosophies in allocating these resources in order to determine success and growth in the long run. The allocation of these resources is most commonly perceived as the functional and cross-functional resources according to the requirement of the business organization. Project resource management is considered to be one of the most essential components of a business sector and requires the transparency to be maintained in terms of demand and supply of the resources to ensure the suitable business activities (Alshurideh, 2022; Dwivedula, 2019; Hamadneh et al., 2021a, b; Hasan et al., 2022).

2.4.2 Career Path

While stating a new project managing the availability of the employees and ensuring their capacity to meet the needs and requirements of the project is also extremely important. This requires the management to identify the capacity of the members involved and also in choosing the right career path for them which also supports their abilities to perform according to the project requirements. This would also support the job description of the team members based upon their previous experiences and current skills.

2.4.3 Training and Development

In most of the cases, the members of the team involved in a new project often lack certain set of skills for the completion of a project. This requires the management to design the training and development sessions for the employees in order to ensure success of the project. This would ensure that all tools and procedure are rightly utilized and monitored for ensuring success for the organization (Laslo, 2010).

2.5 CSF or Best Internal or External Factors Required to Support Program Resource Management

CSF or critical success factors are the activities which a business setup requires in order to ensure the success of the business; this supports the business in allocating its internal or external resources and managing them according to the requirement of the organization by conducting the data and business analysis and in reaching a practical approach for the business sector. This supports the organization to significantly be able to identify the key factors responsible for the success of the organization and how the organization should focus on these key factors for sustaining success for a longer period of time (Kastor & Sirakoulis, 2009).

There are a number of internal or external factors responsible for project resource management within a business sector. Some of these factors include in Table 1.

All these internal and external factors are responsible for acting as the driving force for an organization to manage and support its program resource management and allocating the right resources at the right time and conveying the performance of the organization to the stakeholders more effectively.

Table 1 The main internal and external factors responsible for project resource management

Internal factors	External factors
• Plans and policies of an organization • Human resources • Financial resources • Marketing resources • Corporate image • Labour management of the organization • PR relations • Quality of infrastructure • Project execution • IT management • Interdependency with the employees	• Customers • Suppliers • Competitors • Marketing and advertisement • Economic environment • Political and legal factors • Technological growth • Social factors • Public

2.6 Assessment and Gaps in Program Resource Management to Support Program Management

There are a number of gaps and issues observed while intending to support the project resource management for an organization. A few of the most common gaps include identifying whether the organization has the right set of resources available or not and how an organization should be able to identify which resources to request further and how. Moreover, the organization also needs to identify whether all the required resources are proactively involved within the teams and if these resources need to be explored further. Moreover, the organization also needs to effectively communicate the gaps among the team members involved in order to plan the right set of solutions for the team members (Smith, 2003).

In order to support the concept of project resource management, the organization needs to equip themselves with the resource the capabilities and processes being put to right use in terms of amount of time, money and manpower to ensure the most suitable project resource management.

3 Data Gathering

To accomplish the aims of this research, the researchers conducted three interviews among program managers from three different government organizations that are essential, huge and have a high reputation, which are;

(1) Emirates Group.
(2) Water and Power Producer Companies (IWPP).
(3) The Executive Council of Dubai.

The program managers were the purposive sampling in this study who are the most applicable professionals in the program management field. Also, they have experiences, knowledge, skills, and tools. The interviews were personal, structured, and contained qualitative data. The questions were to cover our research purpose in-depth and details. Thus, the selected program managers were from various industries, which will assist the researchers in gaining the required information from different perspectives and views.

To reach these organizations, the researchers contact the program managers' secretaries to take the permissions to meet the program managers through call conversations and emails. The importance of meeting and conducting the interviews with the program managers explained as well as the aims of the research discussed with the secretaries (Joghee et al., 2020; Kashif et al., 2021; Khan, 2021; Lee & Ahmed, 2021). After getting program managers' agreements, the researchers proposed an applicable date and time for conducting interviews for the project managers. One day before the agreed interview date, the researchers sent a gentle reminder to the program managers in order to assure and confirm their availability.

The researchers were available in the organizations before 15 min of the arranged time. At the beginning of the interviews, the researchers informed the program managers that their responses will be treated highly confidential and will be used for research purposes. The interview will take approximately 45 to 60 min. Also, the researchers took their agreement to record the interviews. Finally, the researchers proceeded to interviews and took the required information and notes in order to achieve the research goal.

4 Data Analysis

The data were gathered from three government bodies where each presented professionals' roles and how crucial are their responsibilities in the success of program management in the authority. This section will discuss key results from the research qualitative data and compare of these primary findings to the literature review.

Emirates Group suggested that organizations can ensure the four factors through effective management strategy where the top management provide the right leadership focused on these factors, facilitate supportive infrastructure and ensure change implementation through proven standards and practices, clearly defining the change and aligning it to the set goals and objectives, effective communication, and through practical training to provide knowledge, skills, and competencies needed for efficient operation as change is rolled out. IWPP suggested that all the employees must complete the Position Qualification Requirement (PQR), written instinct tests, and assessment interview. Doing so gives a good indicator that they are well-trained and competent (Lee, Azmi, et al., 2022a, b; Lee, Romzi, et al., 2022a, b; Mehmood, 2021; Mehmood et al., 2019). For experienced professionals, IWPP chooses them based on the size of the program and its requirements. To check how supportive the infrastructure is, organizations must review their past performance with what they have and how

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good their infrastructure compared to what available in the market. To ensure proven standards and practices, IWPP follows the federal law of power and Abu Dhabi financial law references, follows the Power and Water Purchase Agreement, refers to the international power and water practices in the Middle East and Europe, and attending the yearly user summits that takes place in different countries in the world to check the global standards. The Executive Council of Dubai believes that to ensure the four factors, employees should undergo job-related education programs with experienced professionals and being grouped in teams with similar skill sets. Moreover, it was suggested to create a well-structured framework to gives employees incentives to be more productive and maintain a higher quality of work ethics. The practices build bridges between members to acknowledge the importance of following standards allowing for constant skill growth. The three organizations agreed with the findings in the literature review of how important those four factors resource management.

To improve the capacity and capability for the project and program management, Emirates Group suggested a similar solution to the literature review of providing a capable workforce to support the organization. Emirates Group suggested ensuring consistent, senior-level support the discipline of program management, integrate program management as part of the organization's mission, and involve the staff in the planning for change initiatives (Miller, 2021; Mondol, 2021; Obaid, 2021; Radwan & Farouk, 2021). IWPP's suggestions were about the concept discussed in the literature review of using the right resources at the right time and the concept of priority. IWPP believes that fewer priority projects should be removed or delayed focusing on the projects that are directly supporting the strategy of the company. Also, using the right resource at the right time, the company will have more resources to work with. Similarly, to IWPP, the Executive Council of Dubai suggested that to increase the capacity and capability of the programs, and organizations must focus on their goals and standards for projects.

Emirates Group's implementation for improving the government-wide capability for project and program management is to make sure that executives and stakeholders clearly understand their roles and responsibilities as well as consistency in development and training. IWPP implementation is about using quality tools such as the Deming wheel, Kizan continues improvement, and the fishbone diagram. The Executive Council of Dubai suggested that a clear vision and plan are the key to successful implementation for enhancements.

To improve the government-wide capability for both project as well as program management, there are several recommendations raised from the interviewees. Emirates Group recommended using an integrated approach to develop policy. The integration of performance improvement, goal setting, and the strategic planning process play an essential role in program management. Also, leadership should support program management, as active support from top agency leadership has proved to be a critical factor in the success of change management initiatives. Besides that, establishing roles and responsibilities of the agency's stakeholders in the program management processes will assist in promoting accountability and achievement of set goals. IWPP suggestions were to listen and refer to the department of finance yearly governmental budget that gives clear limitations or priorities of the

country's/government every year requirement. This gives the overall country's vision and mission toward the right project requirement, to avoid objecting and rejection of the projects after putting all the efforts and resources for years. Also, it is very significant that all the EMDs/CEOs of different sectors gather regularly to discuss the main agendas on the development of the country to use all the experience brains to improve all areas simultaneously. The Executive Council of Dubai recommended that government services should coop with the latest technology to serve the public faster, more comfortable, and for consistent improvements. Public awareness about their role in project sustainability. This can be achieved via caretaking and appreciating the projects to promote longevity and quality of projects.

To resolve the issue with the inconsistency in the training and development of program managers, Emirates Group suggested first to make sure that the program manager job series have a clear career path and policies to support the career development of program managers. Also, Emirates Group suggested that organizations should comply with the policies guiding the certification of personnel in program management and design a systematic approach to program managers' training and development. IWPP suggested enrolling program managers in courses that require a real competency/certification. Also, IWPP suggested enrolling the program managers in courses based on their yearly appraisal and direct supervisor recommendation. Emirates Group and IWPP responses were aligned with the findings in the literature review regarding how to choose the courses based on their skills and performances. On the other hand, the Executive Council of Dubai believes that it is impossible to create a consistent training and development program for such practice because of the different functions and services in each organization.

The observation shows a successful strategy followed by top management technique in Emirates Group to allocate the responsibility and skills of stakeholders. The results from Emirates Group interview show significant details in which VIP stakeholders' responsibility are determined and training programs to be conducted when required. The other result summarizes that the Authority priories the communication between stakeholders and consider the opinion of all parties where they believe how significant this sharing will change in the Resource Management requirement and delivering the strategy benefits. Emirates Group offer training program to ensure that all members have clear understanding of the roles of each. On the other hand, IWPP uses modern technique to evaluate the performance of stakeholders and assess the number of completed projects against planned projects. The Executive Council ensures the importance of relating the program topics and functions to the organization nature of works and top management ensures the curriculum of the topics. Similarly, the literature review emphasized that stakeholders should understand governance roles and the authority strategy by utilizing tools and procedures by management and introducing effective resource management initiatives to ensure the full understanding by stakeholders.

It's assessed that Emirates team support each other, and every professional maintain a good environment and IWPP team provide transparency in the meetings between public and private sectors professionals. And the Executive Council support developing team-based project structure that involves various members with different

qualifications. This matches with the research literature review in clarifying that the availability of resource management application helps in strengthening career development and supports business function. Also, this provide a career series for the career development of senior level. This path puts the project managers into higher managerial positions.

The most important results from Emirates Group Interview emphasizes the important of Project Manager Career path, Project Manager Tasks and its effect to the Emirates Group Strategy. IWPP focus on business quality and clear career path to senior management to get the desired output and benefits. This doesn't reflect with literature review views where it highlighted that the government entities lack employees with experiences and background in program management where this may cause a failure in many aspects.

5 Recommendations

The research analyzed the primary data gathered from three government bodies where the analysis highlighted the main findings and finalized the interpretation of each. The main statement that summarized the analysis is addressing the point in which government bodies' lack of professionals in program management that would change in the prosperity of the entities. The three government bodies improve the issue in offering trainings and programs to qualify the organization Human Resources.

There are several essential recommendations to initiate strong program resource management, including:

1. Preparing a clear description of the program resource management roles and responsibilities for the executives and key stakeholders.
2. Creating an official job description, job series, as well as a career path for program managers based on theories that are applied for all organizations.
3. The consistency of the program resource management required to develop and evolve a standards-based model via the federal government.
4. Program resource managers required to initiate a professional community among the federal government. To create this new community, people should be incentives to join the community. They can be incentives with financial bonuses within their organizations, and with volunteer hours from the government.
5. Implementing an integrated approach for both program policy as well as a program road map.
6. Designating senior executives per each organization in order to be responsible for both program policy as well as strategy.
7. Creating integration between program management, strategic planning, goals, and performances.
8. In government bodies, it's recommended to promote successful entrepreneurs that see challenges as opportunities to achieve the success.

9. To consider recommendations in legal aspects, top management should designate more project and program managers for the sake of the success of program management.
10. Develop a high level training and work shop to support program and resource management
11. Set up a strategy to develop a creative lesson learned regards the resource in pervious projects and programs and share it will all program members to better plan future.
12. Create a portal for sharing the information and experience among involved employee in the project to have a better allocation of resource next time.

6 Research Limitation

In despite of the above provided details and information, there were several limitations faced during the research. For instance, we have selected 6 organizations to meet with their program managers and interview them to explore, have more accurate data about the subject and to achieve the research objectives. However, 3 out of 6 organizations have approved our request to have the same completed and which lead to the success of the research. Other limitation faced is the timeline. Due to the official holidays and year end, it was difficult to schedule a suitable time with the interviewees since the time requested is between 45–60 min. In addition, the interviewees were very discreet regarding the information provided during the interview and most of the questions were answered very generally. Which this led the researchers to ask more specific questions to gain the information needed related to the respective organization.

7 Conclusion

Before the start of any project, the resources requirements have to be well-defined including quantity and type since it's an important component in any project success. Resource management application has a huge impact on the success of any program or project if it's applied efficiently. The literature review has deal with the importance of program resource management and its important impact in the government sectors. One of its impacts it helps in reducing the number of outsourcing while utilizing the internal resources skills and experience in achieving the program goals and objectives. As per the interviews conducted with the program managers of Emirates Group, Water and Power Producer Companies (IWPP) and The Executive Council of Dubai, it was concluded that the program manager job series must have a clear career path and policies to support the career development of program managers. It was farther concluded that resource management could be made more effective if more emphasis is put on the importance of project manager career path, project manager tasks and

their effect on the company overall. Further addition was made regarding the fact that resource management puts excess focus on business quality and clear career path to senior management to get the desired output and benefits. If these two are lacking, the organization will suffer in the long run. Applying resource management leads in reaching to a smooth project success. There should more adoption of the resource management in both government and private sectors. Which this will give the opportunity for skills development. Moreover, organizations should be more aware about the benefits of program resource management and arrange for more specific trainings for the respective teams who should apply resource management.

Appendix

Appendix 1: Interview 1 (Emirates Group)

1. **There is no guarantee of success in large-scale, complex change initiatives.**

   However if program management is undertaken by:

   1. **Well-trained,**
   2. **Experienced professionals**
   3. **Supportive infrastructure**
   4. **Proven standards and practices**

We believe that success will be more consistently achieved

How organizations can ensure these 4 factors?

Emirates Group, it can ensure these factors through effective management strategy where the top management provide the right leadership focused on these factors. The top leadership of the group should be equipped with the capacity to coach their direct reports and to facilitate supportive infrastructure and ensure change implementation through proven standards and practices. They should be in a position to engage in conversations with individual team members to find ways of making sure that these 4 factors are taken care of adequately thereby increasing the possibility of success of the change initiative.

Emirates Group can ensure these 4 factors by clearly defining the change and aligning it to the set goals and objectives. Doing so will provide an opportunity for the organization and its leaders and team members to critically review the aspects of the change initiative to ensure they integrate these 4 factors, thereby contributing to the success of the change process.

Emirates Group can ensure these 4 factors through effective communication. They should determine the most effective means of communication for the team members. The communication strategy should take into account aspects like the

timeline regarding how change will be communicated incrementally, which channels to use and what would be the key messages.

Emirates Group can ensure these 4 factors is through effective training to provide knowledge, skills, and competencies needed for efficient operation as change is rolled out.

2. **Program management is not consistently recognized as a management discipline that is essential to government performance, success, and results.**

What *solutions* for improving government-wide *capability* for project and program management

The solutions include ensuring consistent, senior-level support the discipline of program management in Emirates Group; program management should be made an integral part of accomplishing the organization's mission rather than being considered as a technical or administrative specialty focused on the implementation; and, program management staff to be consistently involved in the planning for change initiatives.

What *Implementation* for improving government-wide capability for project and program management

The implementation for improving government-wide capability for project and program management is that which entails executives and stakeholders clearly understanding their roles and responsibilities. It also entails ensuring consistency across the government in both the development and training of the involved personnel, especially program managers.

What *recommendations* for improving government-wide capability for project and program management

(i) The development of government-wide program and project management policy should be done using an integrated approach.
(ii) The leadership should support program management, as active support from top agency leadership has proved to be a critical factor in the success of change management initiatives. Such support is vital in facilitating the alignment of diverse groups within the organization.
(iii) There should be clearly established roles and responsibilities of agency's stakeholders in the program management processes to promote accountability and achievement of set goals.
(iv) Program management should be integrated into performance improvement, goal-setting, and strategic planning process.

3. **There is no consistency across the government in the training and development of program managers. How this can be resolved?**

Considering that competent and experienced program managers are the most critical determinants of successful program, it is important to resolve the problem of lack of consistency across the government in their training and development. In the case of

Emirates Group, it can be resolved first by making sure that the program manager job series have a clear career path and policies to support the career development of program managers. The problem can also be solved by making sure that the Emirates Group comply with the policies guiding the certification of personnel in program management. Besides, Emirates Group should have systematic approach to program managers' training and development.

4. **Organizations executives and VIP stakeholder's governance role requires clear understanding of:**

The role of how programs are derived from strategies

And how programs are delivering strategy benefits

The roles and responsibilities of the program manager

How this can be ensured by training and development?

Training and development within the Emirates Group would ensure that organizations executives and VIP stakeholders have clear understanding of their governance roles by providing them with clear guidance on their roles and responsibilities within the program management processes. It would also enhance their skills, competencies, and knowledge regarding the various aspects of their governance roles, such as how programs are delivering strategy benefits.

5. **Program managers lack a professional community within the federal government that can provide support and a voice on issues affecting the development of program management.**

Give us your opinion in regards to your organization

While in most cases program managers lack a professional community, Emirates Group has made efforts to create a professional community. The efforts have been informed by the need to ensure that program managers work in collaboration with other professionals within the organization rather than working in relative isolation. It has created an environment where program managers are able to participate in discussions of policy, thus allowing their voice to be heard in building and improving program management capabilities within the organization.

6. **A government-wide job series for program managers that spans business functions with a career path that extends into senior career executive management ranks.**

Give us your opinion in regards to your organization

Emirates Group has made considerable efforts in establishing job series for program managers with a career path extending into senior management ranks. It has put a

policy in place supporting the career development of these professionals. As they progress to senior ranks across a job series, their levels of responsibilities also increase.

Appendix 2: Interview 2 (Water and Power Producer Companies)

1. **There is no guarantee of success in large-scale, complex change initiatives.**

However, if program management is undertaken by:

1. **Well-trained,**
2. **Experienced professionals**
3. **Supportive infrastructure**
4. **Proven standards and practices**

We believe that success will be more consistently achieved

How organizations can ensure these 4 factors?

Well, all the employees must complete the Position Qualification Requirement (PQR) that includes all the essential competencies for every job. The same is assessed in written instinct tests and finally with assessment interview and any failure will lead to repeat the exercise till reaching to full understanding and passing all the previously mentioned assessment method. This PQR has different levels for every position in order to be confirmed for the targeted position/designation.

Regarding the experienced professionals, keep in mind that the members of the project are all having not less than 15 years of experience in a relevant field particularly in power and water sector. The members had worked in numerous power and desalination plants that are having different designs and complex changes.

Actually, there is a big supportive infrastructure; one of them was mentioned in the first interview which is using a stable standard simulator. This simulator can be feeded with all the necessary data in order to provide the feasibility of the project in terms of dividends, loses, capability to handle the capital and operating budgets. Additionally, EWEC and ADPC are very professional entities that compares the bid of any open or floating tender in terms of cost effectiveness, innovation, simplicity, flexibility and prompt support to the power grid and water network in case of shortages to achieve sustainability of resources.

I believe this is really very important point, as we keen on to follow the federal law of power and Abu Dhabi financial law references in order to move on a solid foundation. Besides that, we do follow the Power and Water Purchase Agreement which is a standard agreement and was signed and agreed between all the shareholders to manage technical, training, financial and management requirements in which all are compliant with. Regarding a standard practice, we do refer to the International

power and water practices in the Middle East and Europe. This benchmark is regularly implemented between the 10 different Independent Water and Power Producer companies (IWPP) in UAE (From Fujairah till Al Dhafra). Not all that but also in Middle East and Europe as mentioned via attending the yearly user summits that takes place in different countries in the world.

2. **Program management is not consistently recognized as a management discipline that is essential to government performance, success, and results.**

- **What *solutions* for improving government-wide *capacity* for project and program management**

In fact, removing or delaying less priority projects and focusing on the projects that directly supporting the power and water demand that ensures security of the network grid is much better!

Allocating different teams for different projects in which everyone team is dedicated for one project from the day one kick off till handing over the projects. These dedicated teams must always respect the time via starting and completing the projects on time with minimum delays.

- **What *solutions* for improving government-wide *capability* for project and program management**

The capability part can be improved via increasing the capital budget of the project that needs to be handled by capable people. Those people must be result oriented, working as one team, understand the project well, know the quick wins via using simple, effective and innovative methods to during project execution.

- **What *Implementation* for improving government-wide capability for project and program management**

Use the management pioneers' methodologies to organize the projects and achieve the targets for instance, Deming wheel and KiZAN continues improvement. Furthermore, to use the right management tools, for instance fish bone diagram that illustrates the cause and effect actions to identify the bottle nicks and the remedial solutions. Finally, use the skill matrix, SWAT analysis and Pareto diagram that all can guide and lead the project to the desired targets as per the planed duration and achieve the necessary quality.

- **What *recommendations* for improving government-wide capability for project and program management**

Always listen and refer to the department of finance yearly governmental budget that gives a clear limitations or priorities of the country's/government every year requirement. Basically, it gives the overall country's vision and mission toward the right project requirement, to avoid objecting and rejection of the projects after putting all the efforts and resources for years. Additionally, I do recommend that all the EMDs/CEOs of different sectors gather every year twice or tries to discuss the main

agendas pertaining to development of the country in order to use all the experience brains to improve all sectors simultansly.

3. **There is no consistency across the government in the training and development of program managers.**

How this can be resolved?

I addition to the yearly selected training courses by the employees based on the yearly appraisal, direct supervisor recommendation, the management shall select and enroll all the managers together to the one course that needs a real competency/certification in order to be specialist. In the same program to assess the managers in an either examination or interview or (both).

4. **Organizations executives and VIP stakeholder's governance role requires clear understanding of:**

The role of how programs are derived from strategies

And how programs are delivering strategy benefits

The roles and responsibilities of the program manager

How this can be ensured by training and development?

The training department shall use a tool named primavera that organize the project and send daily and then monthly update report to the sectors that shows the work progress in detail. Implement a KPI for individual stakeholder managers that assess total number of completed projects on time and as per requirement. In addition, to have weekly and monthly meetings to ensure alignment between the strategy and the role of the program.

5. **Program managers lack a professional community within the federal government that can provide support and a voice on issues affecting the development of program management.**

Give us your opinion in regard to your organization

In our case since we're a private sector subsidized by the government as we own 40% of the project while the government own 60%, we don't face problem. The reason for that is that it is a must for every stakeholder to provide transparency via having regular meetings. These meetings' agendas are related to all aspects of the project and how construct bridges of supports in technical, administrative and financial terms.

6. **A government-wide job series for program managers that spans business functions with a career path that extends into senior career executive management ranks.**

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Give us your opinion in regard to your organization

In my point of view, this is a good approach that we are implementing not only to do the job in order to be completed on time, but also with the desired quality. Having a career path extended into senior career executive can lead to have the same understanding that consequently will produce the right project specification, as per all the procedures and agreements.

Having this approach can eliminate or minimize deviation of the project requirement from the tasks breakdown. This basically the right plan in order to retain the brains and having them to be loyal toward the work. This can generate proactive approaches and techniques to balance and align the program managers' ways of working into the senior staff way without misstatements that can effect negatively on the project progress or sometimes to the failure to complete the ongoing project.

Appendix 3: Interview 3 (The Executive Council of Dubai)

1. **There is no guarantee of success in large-scale, complex change initiatives.**

However, if program management is undertaken by:

1. **Well-trained,**
2. **Experienced professionals**
3. **Supportive infrastructure**
4. **Proven standards and practices**

We believe that success will be more consistently achieved

How organizations can ensure these 4 factors?

We can achieve that by scheduling consistent form of training for employees to undergo job related education programs in order to sustain an up-to-date level of experience of the relevant work With Experienced professionals, if grouped in teams with similar skills sets, can perform better especially when a suitable leader is involved in managing employees from different sectors and entities While being able to work under a well-structured framework gives employees incentives to be more productive and maintain a higher quality of work ethics mostly beneficial for group of teams with lower skill sets. The practices builds bridges between members to acknowledge the importance of following standards allowing for a constant skill growth.

2. **Program management is not consistently recognized as a management discipline that is essential to government performance, success, and results.**

- **What *solutions* for improving government-wide *capacity* for project and program management**

- **What *solutions* for improving government-wide *capability* for project and program management**
- **What *Implementation* for improving government-wide capability for project and program management**
- **What *recommendations* for improving government-wide capability for project and program management**

Setting goals and standards for projects. i.e. Dubai Government and Sheikh Mohammed Bin Rashid's vision has become the key benchmark unit for setting quality standards in executing projects.

The vision is followed by implementation. Again, His Highness's vision would not reach out without the energy put for implementing wide scale projects up to the completion.

Consistent improvements. With the ever growing age of technology, the overall government services should coop with the latest technology to service the public faster and easier.

Public awareness, the public should be more responsible to sustain the projects by caretaking and appreciating the projects to promote longevity and quality of projects. A simple example, never to throw chewing gums on pavements which can last stuck to a long time effecting the overall visuals of the street.

3. **There is no consistency across the government in the training and development of program managers.**

How this can be resolved?

It is impossible to create a nationwide consistency for such practices. In Dubai there are almost 60 entities. Each holding different functions and services.

4. **Organizations executives and VIP stakeholder's governance role requires clear understanding of:**

The role of how programs are derived from strategies

And how programs are delivering strategy benefits

The roles and responsibilities of the program manager

How this can be ensured by training and development?

To ensure proper exposure of the learning programs to the intended project managers. The topics of the programs should be relevant to the nature of works being exposed to the project managers. Executives should review the curriculum modules for each course.

5. **Program managers lack a professional community within the federal government that can provide support and a voice on issues affecting the development of program management.**

Give us your opinion in regard to your organization

The lack comes because of the absence of dedicated proper research and development program to become solely assigned to support the project managers. A simple solution is to use team based project structure (horizontal style) with members from different entities and backgrounds.

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Project Quality Management in the United Arab Emirates Mining and Construction Sector: A Literature Review

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Abstract The United Arab Emirates (UAE) presents a special set of circumstances for sustainable long-term development and economic growth. In this paper, quality management in the mining and industries have been identified such circumstances. More specifically, this paper examines the level of integration of quality management practices in UAE's mining and construction sectors. Using a literature-based approach, the paper identifies the common factors that lead to failure during project management. Recommendations are also offered accordingly. Also, this paper concludes that although there is a general awareness of the need for quality management in the UAE, quality related issues are not uncommon in both industries. Moreover, delays and poorly structured processes are the main issues causes of low quality projects.

Keywords Project quality · Construction · Mining · UAE

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_73

1 Introduction

For many years, crude oil has been the biggest contributor to the economy of countries in the Middle East, including United Arab Emirates (UAE). Oil mining is still an important activity in the UAE but the recent price instabilities and transition from overreliance on hydro fuels has forced the region to diversify its focus to other minerals and the construction industry as a way of bolstering the economy even more (Shahbaz et al., 2014). Modern highways, connecting high end cities have emerged within a short period of time. Today cities like Dubai that were once barren deserts have transformed into beautiful cities, characterized by modern hospitals, hotels, schools and airports (Aburayya et al., 2020; Delgado, 2016; Taryam et al., 2020). In fact, with the ongoing plans to transform Dubai into a major tourist destination, the construction industry might soon be ranked higher than oil as the leading contributor to the economy (Al Batayneh et al., 2021; Al Shebli et al., 2021; AlSuwaidi et al., 2021; Madi Odeh et al., 2021).

From an economic point of view, growth in the construction and mining industries is an entirely good thing. Yet, the complexity that is inherent in new projects presents significant huddles to researchers and project managers on the basis that determining the vital success factors is a continuous and complicated process. As Greeff and Barker (2014) declared, one of the common characteristics between the construction and mining industries is their fragmentation. Compared to the manufacturing sector, for example, construction projects involve multiple shareholders including contractors, the government and miners (Greeff & Barker, 2014). As a direct result of this complexity, each year the UAE reports considerable number of construction claims on the basis of low quality projects that fail to meet the stakeholders' requirements (Mishmish & El-Sayegh, 2018). In fact, the main reason for failure in many projects failure to understand stakeholder's needs and expectations as well as failing to consider the consumer environment or the end users of a service or product.

2 Problem Statement

Many construction industries in the United Arab Emirates underestimate the capacity of customers to identify service quality; they fail to apprehend that customers not only evaluate end service but are also affected by the way a service or product is delivered (Alshurideh, 2022; Awadhi et al., 2021; Mishmish & El-Sayegh, 2018). Moreover, the management of mining and construction projects requires a comprehensive understanding of modern management practices coupled with the understanding of the best practices in design and construction (Mehmood et al., 2019; Alshurideh et al., 2022; Shamout et al., 2022). In this paper the author will investigate the important elements of Project quality management in UAE's mining and construction sector.

3 Objectives of the Research

1. To Investigate the level of integration between quality management with projects in the United Arab Emirates mining and construction sector.
2. To study the success and deficiency factors in project quality management.
3. To come up with recommendations that will guide project managers and organizations on proper ways of delivering projects that satisfy customers throughout the project lifecycle.

4 Research Method

This research is based on the Organization Project Management Model (OPM3) as described by the Project Management Institute (PMI). This method is preferred because it not only provides a guideline for understanding the best practices in project management but also recommends measures to ensure that projects meet quality standards including the capability to perform predictably and consistently (Alzoubi et al., 2021; Hanaysha, Al-Shaikh, et al., 2021a, b). In this regard, OPM3 describes three key elements to successful quality Project Management: (PMI, 2017).

Knowledge acquired by investigating successful projects.
Assessment of existing needs (i.e. level of integration of quality management with projects in the UAE's mining and construction sector) and recommend improvements.
Improvement based on assessments to determine the necessary steps to attaining improvement goals.

The research employed a literature-based approach as the primary data collection method. In this regard, the authors reviewed key research papers and articles relating to quality management in UAE's construction and mining industries.

5 Background and Literature Review

5.1 The Concept of Quality Management

According to Rumane (2017), quality is a strategic imperative that helps organizations improve the bottom line, thus quality is defined on the basis of conformance to guidelines and requirements. In other words, quality is not gauged in terms of the common concepts of goodness, beautiful or excellent (Rumane, 2017). Instead, any service, process or product that is delivered in a manner that conforms to the client's requirements is seen as quality. This view is echoed by Pepall (2014) who stated that quality is "meeting the customer's (agreed) requirements, formal and informal,

at the lowest cost, first time, every time." The Project Management Advisor (PMA) defines requirements in project management as specifications on the "capabilities, features or attributes of the project's deliverables" Requirements are drawn from an analysis of stakeholders' wishes and needs and thus is an expression of the mutual understanding and agreement between the parties involved (Ali et al., 2021; Ghazal et al., 2021). Hence, the definition of quality can be, more or less, said to be the ability to conform to the stakeholder's wishes (Ali et al., 2022; Alnazer et al., 2017).

Yang and Trewn (2004) asserted that although the concept of quality has been around for a longtime, it was not until the 1940s, during World War 2, that people started viewing quality as a statistical concept. During this time, the military introduced statistical sampling techniques to manage quality. Monitoring was also done using quality control charts were production process. Notably, Chung (2002) suggests that it was not until the 1960s that people viewed quality as an organization-wide concept i.e., quality was now not only used in production but in most business processes (Mukherjee, 2006).

5.2 Quality Management in the Construction and Mining Industries

As already established, the general aims of quality management is to achieve standardization (Pepall, 2014). The quality of a mineral or complete structure is an assimilation of all the relevant activities that ensure the results of a mining/construction project are satisfactory. According to the concept of quality management is more than reacting to events in the during site production. Rather, it is a strategic business function that governs all business processes in construction organizations so that organizations that fail to guarantee quality delivery are unable to compete for new projects (Alshamsi et al., 2021; Alshurideh et al., 2019; Alzoubi, 2021a; Farouk, 2021).

In his study Chung, (2002), asserted that the concept of quality management in the construction industry became popular in the 1980s and is still being practiced today. Generally, the ISO 9000 family of quality management standards is used in construction organizations to govern service delivery so that it meets the needs of all the stakeholders involved (Alzoubi et al., 2022; Obaid, 2021). This is possible on the basis that the ISO 9000 quality management standards establish the fundamentals of quality management systems and proposes "coordinated activities to direct and control an organization with regard to quality" (Peach, 2003). The activities of directing and controlling with relation to quality encompass establishing the necessary quality policies, objectives, quality planning, quality assurance, quality improvement: and quality control (ISO, 2009).

The quality planning function consists of specifying quality objectives and putting into place the necessary operational resources, and, processes to attain the quality

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management objectives (Al Hamad et al., 2021, 2022). One of the peculiar challenges faced by researchers and project managers alike is discerning the different in meanings between quality management and quality related activities including Quality Control (QC) and Quality Assurance (QA) (Alnuaimi et al., 2021; Alzoubi & Ahmed, 2019; Joghee et al., 2020). Mukherjee (2006) made the distinction between the terms, thus; QC and QA are essentially sub-elements of project quality management. In terms of functional relevance, QC and QA find meaning during the implementation phase while quality management represents the organization's strategically philosophy as regards project completion (Mukherjee, 2006). In this regard, quality management is relevant at all stages of project (Alketbi et al., 2020; AlMehrzi et al., 2020; Mashaqi et al., 2020). Finally, the aims of quality improvement, are to increase an organization's ability to fulfil all the quality requirements (Al Dmour et al., 2014; Pepall, 2014).

In both construction and mining projects the quality control function involves ensuring that the product specifications are met, inspection of tender documents, etc. (Alzoubi, 2021b; Hanaysha et al., 2021a). At the very basic, quality in construction and mining organizations translates to ensuring high level products that meet the customer's needs (Al Ali, 2021; Kashif et al., 2021). But quality also gives these organizations a competitive edge over competitors and thus safeguards business survival (Rumane, 2017). Similarly, it is equally important to manage the quality of services delivery during the pre-tender stage and this should be practiced through the entire lifetime of mining and construction projects (Guergov & Radwan, 2021; Khan, 2021; Mondol, 2021). As Taher (2009) noted that in construction, and generally all civil engineering projects, a satisfactory product is only essential but not all that is required. In fact, most defects in buildings arise from faulty design processes and inadequacies when incorporating the design in the construction (Akhtar et al., 2021; Eli, 2021).

Just like in most projects, QC consists of activities that govern the implementation of QA programs so that when implemented effectively, QC programs reduce the risk of mistakes and accidents. According to Greeff and Barker (2014), quality assurance in the construction and mining sectors involves ensuring that relevant activities are put in place to meet the quality management requirements of a project. Such activities include setting standards, training guidelines, procedures and policies (Alsharari, 2021; Mehmood, 2021). In essence, good QA practices serve as a shield against quality related issues in the sense that the defined procedures, for example, are a framework to gauge avoid accidents (Aziz & Aftab, 2021; Miller, 2021). Policies are equally important as they give early warnings when there is potential clash of internal and external processes.

6 Findings and Discussion

6.1 Quality Management with Projects in the Construction Sector

From a general perspective, quality management appears to be a well understood concept in the United Arab Emirates (Magd & Nabulsi, 2012). Yet, a more granular review of the literature indicates that construction claims are a leading hindrance in construction projects, mainly because claims cause delays (El-Sayegh & Mansour, 2015; Zaneldin, 2006). In a pilot study by Zaneldin (2006), the researcher studied the main causes of construction claims and analyze their frequency in Abu Dhabi and Dubai. While quality management systems have been adopted in the UAE, there is still a considerable number of quality related claims including changes claims, extra work claims and delay claims. As shown in the Table 1 and as claimed by Zaneldin, (2006), change related claims are the most frequent.

The assertions made by Zaneldin, (2006), conquer with the information gathered from general interviews and surveys conducted in this study. In fact, there was a general consensus among respondents that the most common quality management issues in UAE's construction industry are related to minor issues like not reproducing the design in the actual work and delays. A research by Ren et al. (2008) asserted that delays is generally the most common quality related issues that is experienced in UAE's construction industry (Fig. 1).

El-Sayegh and Mansour (2015) also identified the major causes of delays stating that "they {causes} vary from the unrealistic project duration, nominated sub-contractors, and the culture impacts". These factors have also been identified by other authors who emphasize that delays are a major failure factor and a leading reason for low quality in Saudi Arabia's construction sector (Cruz, 2021; Lee & Ahmed, 2021; Radwan & Farouk, 2021). The importance of time has also been emphasized in quality management literature due to the importance of time delays to both contractors and business owners (Jarkas & Younes, 2014; Mishmish & El-Sayegh, 2018).

Table 1 Causes of construction delays in the UAE

Types of claims	Weighted average	Importance index (%)	Rank
Changes claims	2.48	62.0	1
Extra-work claims	2.46	61.5	2
Delay claims	2.00	50.0	3
Non-performance claims	1.54	38.5	4
Different site conditions claims	1.46	36.5	5
Acceleration claims	1.39	34.8	6
Damage claims	1.14	28.5	7
Contract ambiguity claims	1.07	26.8	8

Factors, Reasons and Causes of delay	Client	Consultant	Contractor
	Regular interference and poor communication	Incomplete contract documents	Inappropriate organization management
	Variation order and late approval for payment	Incomplete drawings	Lack of technical professional in the organisation
	Late supply of information and late decision making	Poor design management	Unsmooth external and internal communications
	Project objectives are not very clear	Slow response	Lack coordination with sub-contractors
	Nomination of Sub-contractors and suppliers	Delayed approval of drawings and BOQ for construction	Centralization with top management
	Many provisional sums and prime cost	Inadequate duration for inspection	Delayed mobilization
	Duration is not enough for constructing the project	Experience of staff in management and technical inspection	Incompetent contractor staff
	Irregular payments and disturbed cash flow of main contractor	Delay in submittal and approval	Poor planning, scheduling or resource management
	Routine of government authorities and approvals	Poor communication between consultant staff	Poor quality control
	Irregular attending of weekly meetings	Poor quality control	Congested construction site

Fig. 1 Factors, reasons and Causes of Delays in UAE's construction sector (Ren et al., 2008)

6.2 Quality Management with Projects in the Mining Sector

Respected to the fact that there are limited studies that have studied the quality management topic in the United Arab Emirates. However, some existing literature show a high level of awareness among mining organizations as declared by Alhanshi and Albraiki (2015). Good to keep in mind that most project managers are aware of quality management and expect mining organizations to act in the best interests of their clients (Alzoubi & Aziz, 2021; Hamadneh et al., 2021). However, other quality managers are not aware of the granular details and activities of the individual functions in quality management (Alzoubi & Yanamandra, 2020; Alzoubi et al., 2020a, b; Lee et al., 2022a, b).

Existing literature asserts these findings. Elbadawi and Selim (2016), for example, suggested that managers of mining organizations in the UAE feel that quality is a critical element of any mining project. Moreover, organizations should play their part to ensure that by adhering to quality standards and supporting initiatives that are support quality management (Alshurideh et al., 2020; Alzoubi et al., 2020a, b). Existing literature also asserts that it is important to establish the requirements of a project at the inception stage so that project participants can attain the right balance the design requirements and the needs of the owner. In a study by Al Hashmi (2013), the author explored project critical failure factors in UAE's gas and oil industries (Fig. 2).

Using the likert methodology as demonstrated by Denni-fiberesima and Rani (2011) found out that scope of works, procurement, and communication are the critical factors that determine the success or failure of mining projects. Referring to

Most Five Important Scope of Work Factors		
Ranking No.	***Code No.***	***Procurement Factors***
1	S2	Absence of structured process for adding work
2	S9	Adding anytime work with overhaul work
3	S12	Change of scope due to absence of real cutoff date
4	S6	Unclear objectives for the project
5	S4	Undefined scope

Fig. 2 Project Scope related factors that result in Quality related problems in UAE's Mining Industry (Al Hashmi, 2013)

Most Five Important Scope of Work Factors		
Ranking No.	***Code No.***	***Procurement Factors***
1	P16	Unsuitable type of contract
2	P12	Inappropriate contractor selection criteria
3	P14	Incapable contractor
4	P17	Lack of experience of subcontractor
5	P13	Poor project material delivery system

Fig. 3 Procurement factors that result in Quality related problems in UAE's Mining Industry (Al Hashmi, 2013)

Most Five Important Scope of Work Factors		
Ranking No.	***Code No.***	***Procurement Factors***
1	C2	Un-established communication procedure within the project organization
2	C5	Lack of communication between stakeholders
3	C13	Lack of sharing information
4	C7	Incompetent project documentation management system
5	C12	Late and incomplete feedback

Fig. 4 Communication Factors that result in Quality related problems in UAE's Mining Industry (Al Hashmi, 2013)

scope, for example, at the very basic, this involves the owner's requirements so that quality consists of balancing the aesthetic needs with the owner's economic muscle. Scope may also include the professional's needs for time and adequate resources to complete a project. Figure 3, shows the common failures associated with the scope of construction projects. Al Hashmi (2013) also discussed the other two group of factors, identifying five areas of deficiency for each as seen in Fig. 4.

7 Conclusion and Recommendations

The mining and construction industries are two of the biggest contributors to UAE's development and economic growth. Because of the backward and forward linkages that these two industries have with each other and other industries, sustainability and quality are inescapable requirements. In essence, the construction and mining sectors have multiplier impact on larger economy. This research has shown that project participants in the UAE are generally aware of these facts and also the need for quality

management. Yet, quality related issues are still an issue in UAE's construction and mining projects.

Based on the outcomes, the deficiency factors in terms of quality management evidently revolve around easily solvable issues such as delays during the inception stage and broken communication channels. In this regard, the authors believe that a shift in focus to structured process is the way forward for both industries. In essence, the absence of structured processes hinders the important functions of total quality management on the basis that there is inadequate control of work activities which eventually plays a key role in quality related issue, particularly time delays. On a practical level, the problem of unstructured problems can be overcome by developing a project steering committee which is involved in managing the project from start to finish and approves any additional work. Of course, proper communication channels are a vital requirement for such a committee to function appropriate. As discussed above, communication is also an important deficiency factor in UAE's mining and construction sector. To avoid breakdown in communication, it is recommended that organizations put in place new communication channels, encompassing all project participants. Preferably, such a system should be implemented at least three months prior to initiation of the project.

Finally, in the case when quality claims cannot be avoided claims should be settled and resolved swiftly to avoid delays. The paper proposes three methods of resolving claims in that regard; litigation, mediation, arbitration or negotiation**.** But the more important step is to analyze the causes of delays in projects. The results of this study indicate that this is an important success factor in UAE's mining and construction industry. Not only that, but quality assurance, quality control and timing can help organizations to improve quality management systems.

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E-Government Implementation: A Case Study of Jordanian e-Government Program

Mua'ad Abu-Faraj, Ra'ed Masa'deh, and Muhammad Turki Alshurideh

Abstract The diffusion of Information and Communication Technologies (ICTs) including the high-speed Internet within the private sector and the exemplar of the private sector's implementation and use of e-commerce and e-business have caused the public sector around the world to start thinking about this phenomenon become aware of its potentials and consequently utilize them. Therefore, governments around the world started investing heavily in e-Government projects, along with e-services in order to exploit the expected benefits of this phenomenon. E-Government is a new approach followed by nations in providing better services to people and businesses. It increases the efficiency of departments, reduces the cost, streamlines the processes and thus provides several benefits to all stakeholders involved. In this paper, we describe a case study on the successful implementation of e-Government in Jordan using Chan, Lau, and Pan's e-Government Implementation Framework. The various e-Government initiatives undertaken by the Jordanian government have been described using the four components, namely information content, ICT infrastructure, e-Government Infostructure, and e-Government promotion.

Keywords Jordan · MoICT · e-Government · m-Government · ICT infrastructure · Information content · e-Government infostructure · e-Government promotion

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_74

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1 Introduction

Many definitions for Electronic Government (e-Government) have been adopted. For example, (Heeks, 2001) defined e-Government as the initiative of the public sector to use ICTs to improve existing processes and good governance, build good relationships within society, provide citizens and businesses with more convenient access to online government services, and increase effectiveness and efficiency in the public sector entities. E-Government services can enhance a country's economic and social development by releasing citizens' time and cost, providing citizens with more convenient access to government information and services. Government e-services also encourage foreign investment that will contribute to a country's economy and social development.

E-Government has been recognized as a tool for radically improving the way governments interact with their citizens. While the obvious benefits of e-Government include providing convenience and easy access to customers thereby resulting in improved services to citizens, reduction of costs (by re-deploying resources from back-end processing to front-end customer service); providing easier access to information, increasing transparency and communication between government departments and with the public, the long term benefit of e-Government is also to make it easier for people to conduct their daily lives and business in the nation, thereby making it an attractive location to attract global talent. On the other hand, introducing e-Government requires a transformation in the way the government structure functions—thereby requiring a change in the organizational culture, managerial styles, systems and procedures apart from large financial investments towards technology upgrades. In order to ensure that e-Government is actually bringing about the changes that are desired (via the benefits) it is vital that strict performance measures be instituted on a continuous basis to check the effectiveness of e-Government.

In this paper, we describe a case study on the successful implementation of e-Government in Jordan. This study is done based on Chan, Lau, and Pan's e-Government Implementation Framework which has been published in by Chan et al. (2008). The various e-government initiatives undertaken by Jordan government have been described using the four components, namely information content, ICT infrastructure, e-Government infostructure, and e-Government promotion.

2 Jordan e-Government

E-Government in Jordan is a national program initiated by his Majesty King Abdullah II. The purpose of the e-Government program is to improve the performance of government backend processes that generate services with the end users in terms of efficiency, accuracy, time and cost effectiveness, transparency, and accountability. Services are at the heart of e-Government in Jordan. E-Government in Jordan is dedicated to delivering services to people across society, irrespective of location,

economic status, education or ICT ability. Government e-services should be delivered to citizens in a seamless manner, citizens should have the ability to use the government e-services and also feel confident using them as declared by MoICT (2013) and Blakemore and Dutton (2003).

In 2017, the Jordanian government unveiled its Economic Growth Plan (EGP) that aims to automate procedures to reach an e-government by 2020. In 2018, citizens and businesses have access to more than 100 e-Services offered by various institutions, with the number expected to reach 131 e-services in 2019 and 293 e-services in 2020 as given by Ghazal (2018). According to the United Nations (UN) e-Government survey 2018 as mentioned by United Nations (2018); Jordan ranked 98th globally and 8th regionally. The purpose of this survey is to measure countries' use of information and communications technologies to deliver public services. The Index captures the scope and quality of online services, status of telecommunication infrastructure and existing human capacity and is rated between zero (lowest) and one (highest). Despite Jordan's e-Government Development Index (EGDI) value was 0.5575 compared with 0.5123 in 2016, Jordan drops seven places globally.

The key emphasis of the Jordanian e-Government program has started with the re-engineering of processes to become more efficient, as well as human performance development and eventually, deployment of best practices using the latest technologies as a tool to enable government stakeholders to implement the new processes. The Ministry of Communications and Information Technology (MoICT) has been assigned to take the lead in coordinating the efforts of implementing the e-Government program and providing support where needed in the implementation MoICT (MoICT, 2013).

The deployment of e-Government in Jordan can be achieved by consolidating government resources, engaging greater citizen participation in the local economic development and facilitating citizen access to government services demonstrating more citizen empowerment and less government control over public data. e-Inclusion, the participation of all in e-Government is imperative to promote economic and social empowerment through ICT for all citizens including vulnerable groups pre-identified by the United Nations as the poor, illiterate, blind, old, young, immigrants and women as mentioned by the United Nations in United Nations (2012). The Strategy for development and implementation of e-Government in Jordan crystallizes this vision into objectives; it presents priority e-Government initiatives, tools and projects as shown in Fig. 1; and it identifies targets and milestones to facilitate performance control and raises accountability by clearly defining the responsibilities of key stakeholders as given by Majdalawi et al. (2015).

This strategy emphasizes the e-Government role of encouraging and motivating government entities to deliver high-quality customer-centric and performance-driven services to e-Government beneficiaries while transforming from traditional service delivery to more effective and efficient service providers to their beneficiaries (Citizens, Residents, Visitors, Businesses, Government Entities and Government Employees).

The four stages of e-transformation are evolving around the maturity of service delivery (emerging, enhanced, transactional, Connected). Government of Jordan

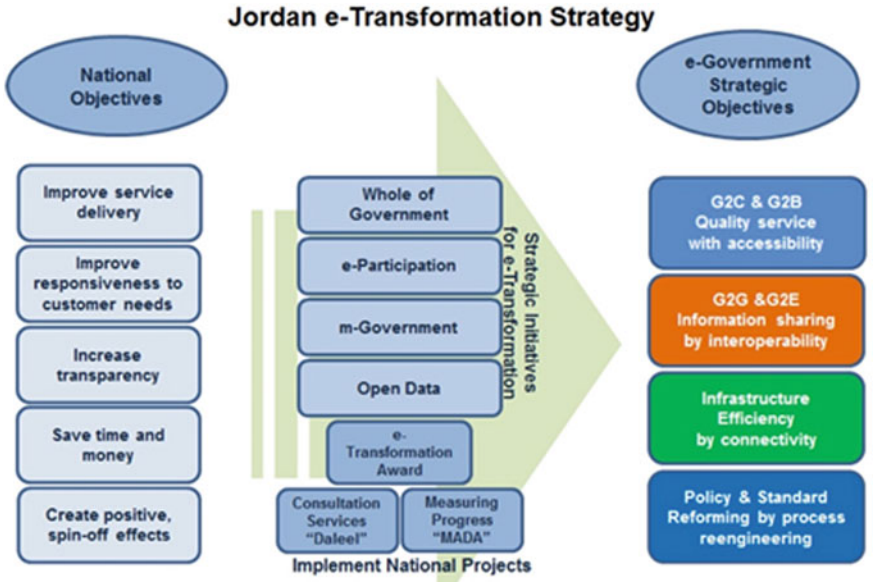

Fig. 1 Jordan e-Transformation Strategy (MoICT, 2018)

is aiming to achieve the transactional stage by end of this Strategy term. Jordan is currently in the late enhanced stage given that Government of Jordan offer more sources of information through the National Government Portal (www.jordan.gov.jo), the National Contact Center (NCC), the National Mobile Portal and National SMS Gateway as given by Jordan e-Government (2017).

3 E-Government Implementation Framework

Abu-Shanab and Abu Baker (2011) have proposed a model for evaluating the Jordanian e-Government website from users' perspective, this study was conducted in 2011. This model was proposed based on study a sample of 300 Jordanian students, they were asked to perform specific tasks and answered questions related to these tasks. The study focused on usability, accessibility and privacy/security as factors in predicting the adoption of e-government website.

Chan et al., (2008) offer a macro perspective of the various activities involved in the implementation of e-Government through an interpretive analysis of the various e-Government-related initiatives undertaken by the Singapore Government. The analysis led to the identification of four main components in the implementation of e-Government, namely (i) information content, (ii) ICT infrastructure, (iii) e-Government Infostructure, and (iv) e-Government promotion. These four components were then conceptually integrated into the e-Government Implementation

Framework. Sethi et al., 2008) have applied the same framework proposed by Chan et al. (2008) to study the case of the e-Government in Dubai. In this paper, the same framework implemented by Chan et al. (2008) and (Sethi et al., 2008), will be used as a descriptive tool to organize and coordinate various e-Government initiatives in Jordan. This framework will also be used as a prescriptive structure to plan and strategize e-Government implementation in Jordan.

4 ICT Infrastructure

Jordan is already a regional leader when it comes to the ICT sector and one of the main launch pads of entrepreneurship in the Middle East and North Africa. The sector is one of Jordan's fastest growing industries, contributing 12% of the GDP and creating over 80,000 value-added jobs (6% of the labor force). Jordan's ICT exports grew eight-fold since 2001 and currently reach over 40 countries around the globe. Amman is recognized as one of the 10 best destinations to start a technology firm worldwide and a leading center for developing Arabic internet content as mentioned by Oxford Business Group (2018).

The ICT sector in Jordan consists of the IT industry (software and content providers), the telecommunication industry with three main telecom companies (Orange, Zain and Umniah), and the Business Process Outsourcing (BPO) industry (call centers). The ICT sector accounts for approximately 12 percent of GDP direct and indirect, and 84,000 jobs (direct employment figures for the IT industry reached 16,000, with indirect and induced employment for ICT estimated at around 68,000). The sector attracts an average of USD 150 million in investments annually as given by MoICT (2017). Competition is strongest in the broadband and mobile markets. Jordan has emerged as a regional tech startup hub due to an ICT-focused educational system, low startup costs, and business-friendly environment. Its growing reputation is increasingly attracting international capital eager to tap into the region's under-served, but growing online market. Due to the country's small market, most start-ups in Jordan either focus exclusively on, or grow with, the expectation of expanding into the wealthier markets of the Middle East Gulf Region as mentioned by MoICT (2009).

The three network operators compete in a mobile market, with a majority of their subscribers being prepaid users. All three have launched LTE networks, which is underpinning mobile broadband growth. The potential for large-scale mobile internet penetration due to competition has captured the attention of Jordan's technology start-up companies (Al-Omari, 2006). Many are developing applications to target the higher spending demographic traditionally associated with mobile internet early adopters. Jordan's initiative to develop an e-payment infrastructure coincides with a rollout of Near Field Communications (NFC) mobile payment terminals across Jordan by MasterCard and a number of partners.

In March 2015, the Central Bank of Jordan (CBJ) announced the launch of the eFAWATEERcom portal (www.eFAWATEERcom.jo) that will enable clients inquire about, review and settle their bills on-line. The portal was established in partnership with Madfoo3atCom for Electronic Payments Company as the main operator, MasterCard Internet Gateway Service (MiGS), and Emerging Markets Payments Group (EMP Group) as the hosting company (Times, 2017). Payments through eFAWATEERcom, an online bill payment service, have increased to JD3.643 billion by the end of July, 2018, compared with JD1.208 billion in the same period of 2017, marking a 200 per cent increase, the number of bills paid through the service in this year's January-July period stood at 4.869 million, compared with 2.303 million invoices that were paid in the same period of 2017, as given by Times (2018).

The Jordanian government is committed to completing its National Broadband Network (NBN) project, which is owned by MoICT. The objective of the National Broadband Network is to connect all public schools, governmental entities, health entities, community colleges, and knowledge stations. The network has been broken up into 3 phases, Middle phase, North phase and South phase. These phases are connected to each other by an Overlay Network which will provide physical connectivity between the Point of Presences (POPs) for each module and the National Data Centers. Public facilities will be connected to the National Broadband Network by the end of 2019, this will greatly boost e-services, e-commerce, e-health and e-education in Jordan. The network will provide high speed connectivity between public facilities, hospitals, schools and government agencies (Ghazal, 2016).

5 Information Content

The United Nations has identified "Five Stage e-Government Model", this model is useful in developing the e-services that are being offered by the various government departments in Jordan as shown in Table 1 as published by United Nations (2002).

In 2018, citizens and businesses have access more than 100 e-Services on the National Government Portal four of which are transactional and three of those services offer online payment through the Jordan Payment Gateway (JoPAY). Many more online information and interactional services are offered on government official websites. The National Mobile Gateway and SMS Gateway offer 40 Government

Table 1 The Stages of e-Government

The Stages of e-Government	
Emerging	An official government online presence is established
Enhanced	Government sites increase; information becomes more dynamic
Interactive	Users can download forms, e-mail officials and interact through the web
Transactional	Users can actually pay for services and other transactions online
Seamless	Full integration of e-services across administrative boundaries

e-Services that are offered by 22 government agencies while the National Contact Center (NCC) is currently serving citizens and businesses by answering calls for 22 government agencies regarding over 200 services in addition to receiving citizens' complaints and suggestions against government services. In addition, as of today, 77 government Agencies have subscribed to National SMS Gateway push services (MoICT, 2017).

At the time of the portal launch in 2003, the Jordanian e-Government was in "Emerging Stage" with an Internet presence through its official portal with 15 e-services, in addition to launching the strategic plan of the e-Government in Jordan. Also, during the emerging stage, the government started working on the National Broadband Network and the Secured Government Network (SGN). E-government efforts accelerated in Jordan since 2003, entering the "Enhanced" stage three years later. By 2006 the number of e-services rose to more than 30, also the government launched the National SMS gateway.

The Jordanian e-Government project has entered "Interactive Stage" in 2009, with 55 online e-service also the government focused on providing newer official websites and enhanced national portal. Furthermore, the e-Government integrated many systems such as Government Finance Management Information System (GFMIS) by Ministry of Finance, Human Resource Management Information System (HRMIS) being developed by the Civil Status Bureau and Inventory Management System that is developed by the General Supply Department. In 2013, the government has activated the e-Government Steering Committee (EGSC) which is responsible of setting the strategic directions for e-Government in Jordan as announced by the Jordan e-Government (Jordan e-Government, 2017). The Jordanian e-Government promoted to "Transactional Stage" in 2013, were 96 e-services have been released including mobile services. The government also activated e-Procurement in addition to the e-participation policy. The government utilized the existing shared and composite services, integrate related vertical services and integrate government systems through Enterprise Service Bus (ESB) for the purpose of providing cross governmental services. The Jordanian e-Government is supposed to enter the "Seamless Stage" by 2020, were the number of e-services will be more than 290 e-services, and all public facilities are connected to the National Broadband Network.

To improve government efficiency and enable each entity to focus on its core functionality rather than managing administrative and financial systems, government must work as a holistic government by organizing and standardizing processes across government entities around user needs. This will solve the current silos of public sector which create redundancy and fragmentation in government. This approach can also enable different entities to reap the benefit of information sharing to facilitate service provision and reduce the burden on citizens in term of running around different agencies to authenticate documents and clearances. Table 2 shows the development stages of the e-Government in Jordan.

The governmental departments in Jordan have huge differences in its technical competencies, core business process and each of them is equipped with uniform applications, this forced the e-Government management to use a single centralized entity with well-defined common tools known as National e-Government tools. These

Table 2 Jordan e-Government Transformation into Maturity

e-Service	2003–2005	2006–2008	2009–2012	2013–2015	2016–2020
G2C and G2B	15 online e-services	30 online e-services on National Portal and Official websites	55 online e-services on enhanced National Portal and newer official website	96 online e-services on enhanced National Portal and newer official website launching Mobile services	More than 100 online e-services on 2018 Launch Bekhedmetkom e-services to reach 131 e-services in 2019 and 293 in 2020
G2G and G2E			GFMIS HRMIS IMIS	e-Procurement	
Institutional	Launch the initial strategy of e-Government program	National Strategy (2006–2009) Roadmap EGSC 70 CIO units	National Strategy (2014–2016) Roadmap 37 additional CIO units Launching eFAWATEERcom portal	Activate EGSC CIO Council MADA Daleel e-Government award	
Business		Training 10,000 government employees	Training 3000 government employees		Training 5000 government employees
Legal			e-Transaction Amendments Draft	e-Participation Policy	
Infrastructure	Launch SGN to include 14 entities Start working on the National Broadband Network	Launch National Portal SMS gateway	Launch Mobile Gateway, Payment Gateway ESB SGN to include 73 entities with enhanced portal	Transactional National portal PKI Cloud Computing Data Model and Open Data Standards	Public facilities will be connected to the National Broadband Network

tools which are shown in Table 3 are considered as expedited service delivery by other government departments and helped to achieve cost savings by providing commonly utilized e-services to other departments. These tools will help other departments to pay more efforts toward e-Transformation to better serve their beneficiaries and improve the overall progress of Jordan achievements compared with regional and global countries (Navarra, 2007).

Table 3 National e-Government tools

Synergistic Tool	Description
eFAWATEERcom	eFAWATEERcom is an electronic bill presentment and payment system that is owned by the Central Bank of Jordan and aims at providing this service to its customers through different banking channels and payment service providers
MADA	Jordan e-Government Program mandate to follow up on the progress of e-Transformation in Jordan
Daleel	initiative guiding tool to promote e-Government consulting services toward business development and employ accumulative knowledge and experience in enabling government entities to achieve e-Transformation
Bekhedmetkom	Interactive platform to communicate with the government (Ask government, Suggestion, Complement, Complaint, Reporting)
Profiling	Is a portal provided to deliver highly personalized services to users allowing a differentiated personalized experience for each user, by unifying registration procedures and applying high security and privacy calibrations?

6 E-Government Infostructure

At the early stages of the e-Government program in Jordan, there was no national portal for the e-Government services. During the years from 2003 till 2005, the e-services provided by the e-Government was considered as separate services with no major hub to accommodate these services to other participants. The e-Government website (www.jordan.gov.jo), launched in 2008. The number of e-services at that time was around 30 e-services. The aim of the e-Government portal was to be a central hub for all the services provided by the government. The e-Government program started creating new e-services and then integrating these e-services to the e-Government portal.

In 2010, the portal was revamped with the addition of more e-services and new implementation approach. This development phase included an important approach to give the governmental departments the freedom to create their own services and content and publishing these services at their own portals while remaining an integral part of the portal e-Government. This approach can be described in other words by following a decentralized approach with the governmental department and centralized approach in the main e-Government portal. At that time, the portal offered 55 e-services targeting various segments of the community including the individuals, business sector, and the private sector. In 2014, the e-Government program launched mobile services and it added its portal to the e-Government website. These mobile services include launching SMS gateway and launching mobile applications, which are available on iOS and Google Play stores.

In 2016 the e-Government portal was again revamped with more user-friendly features. The e-Government portal provides 96 online e-services on enhanced national Portal and newer official website. The bilingual portal was divided into four groups: citizen, resident, investor, and visitor/tourist. The relevant e-services were

listed under each group. In 2018, The portal is positioned as central hub and it is considered as the gateway to all government departments and their services, in addition to the portal of each governmental department. The portal provides more than 100 e-services with the aim to provide 131 e-services in 2019 and 293 in 2020. The e-Government official website provides the Government Entities which includes prime ministry, ministries, and government agencies. Also, it provides "Bekhedmetkom", which is interactive platform to communicate with the government (Ask government, Suggestion, Complement, Complaint, Reporting). In 2018, the mobile applications portal includes more than 25 different mobile applications.

The fast evolvement of ICT has offered government multiple service delivery channels. Since beneficiaries vary in their literacy, location and accessibility to those channels, they require diverse service provision. Internet has proven to be the least effective channel to reach Jordanians. Mobile penetration has exceeded by far all expectations and should be utilized as one of the main delivery channels in Jordan. Ultimately, e-Government services should transform the way all beneficiaries interact with government.

7 E-Government Promotion

The e-Government Promotion concept focuses on enhancing governance and achieving efficient, convenient, more responsive citizen-oriented public services delivery to provide better access to online public services. The e-Government Promotion can be achieved through:

- Support in improving e-Government interoperability, and applying an effective business process reengineering mechanism (Awareness);
- Assistance in enhancing government online services delivery (Assistance);
- Enhancing e-Government institutional (Assurance).

The e-government promotion involves a three-prong approach of awareness, assistance and assurance (Chan et al., 2008). The first prong of awareness referred to the various publicity activities and strategies employed by the Jordanian e-Government to raise the public's awareness of e-services. Jordanian e-government has conducted different approaches to promote the participants to use e-services, such as online marketing, marketing with government departments, announcement on public TV stations and newspapers. For example, The Jordanian e-Government has launched two tools: "Daleel", and "Bekhedmetkom". Daleel is initiative guiding tool to promote e-Government consulting services toward business development and employ accumulative knowledge and experience in enabling government entities to achieve e-Transformation. Bekhedmetkom is an interactive platform to communicate with the government. The government also has launched a national award for content development which evaluates the creativity and innovation in the content as well as the creativity and innovation in the usage of the content as mentioned by Odat and Khazaaleh (2012).

Creating awareness about government e-services was not enough; the next task was to improve the computer literacy rates. This was addressed by the second prong of assistance, where Jordanian e-Government provided assistance though the different initiatives that targeted the use and diffusion of ICT in schools in Jordan. The government also has launched a national project to connect 3,000 public schools, ministry directorates and military education schools to an integrated network, which enabled more than 1.5 million students and 80,000 teachers to benefit from this project. The communications network will provide teachers and students with an interactive learning environment, and will also allow administrators to communicate more easily, expediting decision making. The Jordanian government also worked on integrating ICT use into university curriculum in areas such as journalism (facebook use, twitter use, etc.), drama and the arts which are becoming ICT and digital content heavy as given by Al-Yaseen et al. (2013).

The final prong of assurance in e-Government promotion is very crucial as it provides assurance on privacy and security issues of e-services (Chan et al., 2008). The quality evaluation of government departments' services by Jordanian e-Government was based on a number of well-defined criteria, one of which was security and privacy of e-services. It was extremely important to Jordanian e-Government that the security and privacy policy of e-services was created in both English and Arabic by the government departments and made known to the users. In order to increase users' confidence in the website, all government departments were advised to add a statement around security of the website and how information was shared with other government organizations. Furthermore, to enhance the reliability of the statement, government departments were instructed to add a link or reference to any kind of legislation in the security and privacy statement. At the same time, online payment security of centralized service, eFAWATEERcom was beefed up to match the world class security standard.

Other than the three prongs of e-Government promotion, Jordanian e-Government also launched a "Bekhedmetkom" through Jordan.gov.jo portal in 2016 to measure customer satisfaction level and enhance the quality of e-services. It invited the public to submit their suggestions, complains, compliments, and views on Jordanian government's official portal, Jordan.gov.jo.

8 Discussion

The Jordanian e-Government provides a variety of online services for both individuals and businesses. The Jordanian e-Government has managed to add more than 100 e-services to its portal, there is still much work to be done in this filed. The percent of e-services that the Jordanian government managed to get online compared to the services it provides is very low, also this percent compared to the other countries in the region is also considered very low.

The ICT infrastructure in Jordan is developing very fast, also Jordan has enjoyed a strong leadership, this enabled Jordan to move from the informational government

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websites to transactional websites and currently the aim is to fully integrate of e-services across the administrative boundaries (reaching seamless phase) by 2020.

Strong Leadership, Commitment and Vision: e-Government is a complex initiative involving multiple stakeholders and entities. The strong leadership with unified and coherent vision is extremely important for e-Government success. The Jordanian e-Government project aims to ease the lives of people and businesses interacting with the government.

Flexible and Robust Infrastructure: The successful implementation of e-Government initiative depends on the underlying ICT infrastructure comprising of secure servers, routers, firewalls, internet connectivity etc. In order to incorporate changes and additions in the technology infrastructure, Jordanian e-Government had formulated a technology master plan (National Strategy Roadmap) right from start for the required infrastructure and its related architecture.

Central Flexible Model: To better manage and monitor its e-Government initiative, Jordanian government chose a hybrid approach which accelerated the release of new e-services. Jordanian e-Government is centrally controlled and monitored the e-services development of various government departments, the government departments were given the freedom to creatively build their own e-services in the earlier phase of e-Government initiative.

Development Strategies: Although the overall vision of Jordanian e-Government remained the same, the development strategies kept changing to meet the vision. The biggest challenge faced by Jordanian e-Government in the initial phase of the e-Government initiative was difference in the technical competence of various government departments. Some departments were technically qualified and demonstrated high competency, while others lacked even the minimum technological infrastructure. To bridge the digital divide among the government departments in the initial phase, Jordanian e-Government established a number of strategies such as providing support to government departments through work teams sharing e-services, and wide training programs.

Development of Human Resources: The e-Government initiative can't be successful without the development of human resources. An individual (citizen or employee) is the basis of the success or failure of this initiative. Without citizens or employees able to accept electronic systems, the e-Government model can collapse. Realizing the importance of raising the technical qualification of both citizens and employees, The Jordanian e-Government launched several training programs for government.

Public–Private Partnerships: e-Government initiatives require a variety of business and IT skills such as business process reengineering, systems analysis and design, networks, software design and implementation etc. In order to address the IT skills shortage, the Jordanian e-Government had formed strategic alliances with private sector to complement its competencies in various areas such as portal hosting and management, customer care, electronic payment, and mobile services among others. These strategic partnerships had been a critical step in achieving both short-term and long-term strategic objectives of Jordanian e-Government.

To conclude, this is believed to be the most up-to-date and comprehensive analysis of Jordan's plans and assessment of its level of readiness for delivery of e-Government services. The findings present a number of key factors that hinder Jordan's e-Government development. These findings can be useful for researchers and practitioners, as they provide rich insights on e-Government development. The findings can be also useful to other developing countries, as they can help them in understanding citizen related challenges when designing, planning and implementing their e-Government initiatives.

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The Impact of the Motivational Culture on the Job Satisfaction of Aqaba Special Economic Zone Authority Employee's in Jordan

Shaker Habis Nawafleh, Ra'ed Masa'deh, and Muhammad Alshurideh

Abstract The aim of this study was to examine the impact of Motivational Culture on the Job Satisfaction among the employees in the Aqaba Special Economic Zone Authority. Descriptive, correlational, cross-sectional design were used by distributing of (115) self-reporting questionnaire, which was consist of three parts; the first part was for the demographical characteristics of the employees, the second part was for the Motivation at Work Scale (MAWS) and the third part was the Short Form Minnesota Satisfaction Questionnaire (SFMSQ). The results revealed that motivational culture and the job satisfaction levels were in a moderate level {38.4 (SD = 4.392)} and {62.6 (SD = 14.87)}. Moreover, the regression results reveals that there was a strong significance positive impact of the motivational culture on the job satisfaction (r = 0.78); and (61%) of motivational culture for the employee could be explained from motivational culture. The positive effect of motivational culture in the promoting a high level of job satisfaction, need more focus by the human resources departments to maximum the benefit of the motivational culture.

Keywords Motivational culture · Job satisfaction · Aqaba special economic zone authority employee's · Jordan

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_75

1 Introduction

Human resources are considered the key to the success of any organization, they are the most valuable and essential part of any successful operating system (Alrowwad & Abualoush, 2020; Lorincová et al., 2019; Rapsanjani & Johannes, 2019). Without Qualified human resources, other resources will be Ineffective (Pancasila et al., 2020), so Organizational goal achievement couldn't depend on the technological excellence alone because the quality of the employees is a crucial foundation stone (Aldmour & Obeidat, 2017; Bernanthos, 2018; Rozi & Sunarsi, 2020; Vanesa et al., 2019). Each organization Seeks to have special characteristics that recognize it from other organizations, these characteristics help the organization to keep the best employees within their team, this characteristic is called motivation (Abuhashesh & Al-Dmour, 2019; Bernanthos, 2018; Hayajneh et al., 2021; Paais & Pattiruhu, 2020; Rozi & Sunarsi, 2020). The presence of expert and high-quality employees will enhance the productivity of the organization (Al-dalahmeh et al., 2018; Obeidat & Altheeb, 2018).

1.1 Background

Human resources are considered the key to the success of any organization, they are the most valuable and essential part of any successful operating system (Alrowwad & Abualoush, 2020; Lorincová et al., 2019; Rapsanjani & Johannes, 2019). Without Qualified human resources, other resources will be Ineffective (Pancasila et al., 2020), so Organizational goal achievement couldn't depend on the technological excellence alone because the quality of the employees is a crucial foundation stone (Aldmour & Obeidat, 2017; Bernanthos, 2018; Rozi & Sunarsi, 2020; Vanesa et al., 2019). Each organization Seeks to have special characteristics that recognize it from other organizations, these characteristics help the organization to keep the best employees within their team, this characteristic is called motivation (Abuhashesh & Al-Dmour, 2019; Bernanthos, 2018; Hayajneh et al., 2021; Paais & Pattiruhu, 2020; Rozi & Sunarsi, 2020; Vanesa et al., 2019). The presence of expert and high-quality employees will enhance the productivity of the organization (Al-dalahmeh et al., 2018; Obeidat & Altheeb, 2018).

1.2 Problem Statement

Organizational employee satisfaction affects their performance which has a negative effect on the organization's performance and its ability to perform the desired goals (Paais & Pattiruhu, 2020), and it is difficult to suppose that we can have an effective business without professional teamwork which is hard to have without a reward

and motivation system (Ali & Anwar, 2021), each organization needs to give more attention to the employees' needs and talents in order to help them in their future plans which help in the improvement of the company's productive (Pancasila et al., 2020).

1.3 Significance of the Study

Human resources management department in the Aqaba Special Economic Zone Authority intended to enhance the job satisfaction levels for its employees. The researcher highlights in this study the positive impact of the motivational culture on the job satisfaction levels for the Aqaba Special Economic Zone Authority employees and helps the Human resources management department work hard to achieve their aim to increase job satisfaction levels of their employees.

1.4 Purpose and Research Questions

The objective of this study was to examine the impact of motivational culture in the Aqaba Special Economic Zone Authority on job satisfaction levels for its employees. To accomplish this goal, the researcher focuses on a number of objectives:

- To recognize the levels of motivational culture and job satisfaction among the employees in the Aqaba Special Economic Zone Authority.
- To investigate the impact of motivational culture on job satisfaction among the employees in the Aqaba Special Economic Zone Authority.

These objectives guided the researcher to identify the following research questions:

- What are the levels of motivational culture and job satisfaction among the employees in the Aqaba Special Economic Zone Authority?
- Is there an impact of motivational culture on job satisfaction among the employees in the Aqaba Special Economic Zone Authority?

Accordingly, the following hypothesis is presented. In fact, in this study the decision to accept or reject the hypothesis is based on statistical significance. Statistical significance considered as a description for a result or experiment when the probability is less than the significance level. The current study objective to examine the following hypothesis:

H1: There is an impact of motivational culture on job satisfaction among the employees in the Aqaba Special Economic Zone Authority.

1.5 Study Variables and Framework

This study was involved two major variables:

(1) Motivational Culture

The word motivation is originating from the Latin word "movere", which means to "transfer" or "push" (Pang & Lu, 2018).

Motivation is a group of situations and worth's to influence the individual to realize the specific goal in correspondence with the individual goals (Sudiardhita et al., 2018). It could be a form of organizational philosophy and values adopted by human resources within the organization, but the formation of motivation is enhanced by the organizational managers (Bernanthos, 2018).

Developing a well-structured motivation system is an essential element for the organization to authorize employees to produce the maximum benefits for the organization (Pang & Lu, 2018).

Work motivation is the force that remains within an individual, which, fosters his attitude to take action (Barasa et al., 2018). It is the gift of mobility that inspired a person's affection for them to work simultaneously, work productively, and incorporated with every attempt to achieve satisfaction (Vanesa et al., 2019).

Motivational culture is a set of phenomena of physical and spiritual survival of the organization's personnel: the controlling moral rules and values, customs that emerge from the moment of induction of the project and are shared by the majority of its employees (Lebedynets & Zhurakivska, 2021).

(2) Job Satisfaction

Job satisfaction reflects the emotional state (either pleasant or unpleasant) in which employees saw their work. Job satisfaction reflects an employee's point of view across his work, job satisfaction is a serious agent to be considered in the perception of the organizational behavior (Barasa et al., 2018; Masa'deh, 2016; Vratskikh et al., 2016).

Job Satisfaction is a fundamental standard that cannot be overestimated, representing an integration of psychological, physiological, and environmental situations that mark an employee's satisfaction with their job, emotional stability, and judgment (Davidescu et al., 2020; Masa'deh et al., 2019; Sudiardhita et al., 2018).

Job satisfaction is one of the most significant factors to get the best work result. When a person feels satisfaction in the work of course he will attempt as much as possible with all the skills that have to accomplish the job task (Barasa et al., 2018).

In order to achieve the study goal, the researcher develops the following Study frame work:

Source: Authors

2 Literature Review

2.1 Motivational Culture

The influence of the motivation and job satisfaction against employees' performance among Indonesian employees were studied in a descriptive study by Bernanthos (2018) depending in the results of an (114) employees' respond which revealed that there was moderate levels of a motivation and job satisfaction, and positive, significant effect of the motivation process on the employees' performance. Furthermore, a study was conducted by Rozi and Sunarsi (2020) in South of Indonesia to determine the effect of motivation and work experience on employee performance; the researchers involved (43 respondent) in their study and the result reflect that (47.6%) of the employee performance are influenced by motivational attitude.

2.2 Job Satisfaction

Job satisfaction considered as the most influential variable on the employee's performance, as a conclusion of the results of a descriptive study of Rapsanjani and Johannes (2019) which was aimed to examine the effect of remuneration, work motivation and job satisfaction on employee's performance among Indonesian employees in housekeeping department in Jakarta. Moreover, Ali and Anwar (2021) conduct a study in Iraq among 128 bank employees to analyze the effect of the culture on employee satisfaction in different banks in 2021, and the result show that compensation as motivation has significant positive influence on job satisfaction in the analysis of the randomly collected questionnaire which was developed by researchers previously.

2.3 The Impact of Motivational Culture on Job Satisfaction

The effect of compensation, motivation of employee and work satisfaction to employee performance pt. Bank in Indonesia were studied by Sudiardhita et al. (2018) among 346 Bank's employees, and the results shows that the work motivation has a positive

and significant effect on job satisfaction which affected positively in the employees' performance. From another point of view, Paais and Pattiruhu (2020) perform a study to investigates the effect of motivation, leadership, and organizational culture on job satisfaction, and employee performance among employees in Central Maluku Regency, Indonesia, the result showed that work motivation and organizational culture had a positive and significant effect on performance, but did not significantly influence employee job satisfaction.

3 Methodology

3.1 Research Design

This study used a descriptive, correlational, cross-sectional design to assess impact of the motivational culture on the job satisfaction among Aqaba Special Economic Zone Authority Employee's, Jordan, and evaluate the levels of motivational culture among employees.

3.2 Population and Sample

The accessible population of the study was all employees in the Aqaba Special Economic Zone Authority. The sample size was calculated using G-power program with α probability of (5%) and power of (95%), with a medium effect size of (0.15), so the calculating program indicated the minimum number of sample is (107) employees.

3.3 Instrument of Data Collection

In order to achieve the goal of the study and based on previous literature, the researcher designed the study questionnaire, which was consisted of three parts; the first part was for the demographical characteristics of the employees, the second part was for the Motivation at Work Scale (MAWS) and the third part was Short Form Minnesota Satisfaction Questionnaire (SFMSQ).

The Motivation at Work Scale (MAWS) was used on its English version for data collection. It was developed by Gagne et al. (2010). It contains 12 items. First three items were related to intrinsic (indicating inner motivation), next three to identification (self-actualization), next three for introjections (getting inspiration) and the last three items were related to extrinsic (motivated from external sources, i.e., promotion, money etc.) level of motivation. A 5-point Likert system was used to respond

Table 1 The instrument reliability

	Variables	No of items	Alpha value
1	Motivation at Work Scale (MAWS)	12	0.88
2	Short Form Minnesota Satisfaction Questionnaire (SFMSQ)	20	0.78

Prepared by researcher depend on pilot study results

to the items, (1) for strongly disagree, (2) for disagree, (3) for Neutral, (4) for agree, and (5) for strongly agree. The increased of the scale sub-total indicated increase Motivational level (Gagne et al., 2010).

The Short Form Minnesota Satisfaction Questionnaire (SFMSQ) in an English form, was used to assess job satisfaction using a 5-point Likert scale ranging from one (extremely dissatisfied) to five (extremely satisfied). It consists of 20 items, and each item represents a feature in the work environment. The possible scores for SFMSQ range from 20 to 100. The level of job satisfaction classified to high satisfaction for score of (>75), low level for score (<25), while the score in the middle range of percentile (26–74) would indicate average satisfaction level (Al-Dmour et al., 2021).

For collecting the data, convenience sampling technique was used to distribute the questionnaire for the employees. But before conducting the study, pilot testing is performed by taking (15) employees for the purpose of checking the reliability of the questionnaire. The responses of the employees were scored and the reliability of the instrument was determined using Cronbach's Alpha. The statistically acceptable value of the coefficient of alpha responses to the questionnaire for all Cronbach is 70%. The result shows that the Cronbach's alpha ranges from (0.78) to (0.88) which show the scale is reliable, as in Table 1.

3.4 Data Analysis

After collecting the valid questionnaires and calculating the response rate, the data has been coded manually and entered to Statistical Package for Social Sciences (SSPS version 21) data base. Descriptive statistics (mean and standard deviation) were used to the employee's demographical characteristics. Another descriptive statistic (mean and standard deviation) used to calculate the motivational levels and job satisfaction level for research question number one. Inferential statistics (Pearson correlation and simple liner regression) were used for testing the impact of motivational culture on job satisfaction level for the employees in order to answer the question number two.

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3.5 Ethical Considerations

The approval of the Aqaba Special Economic Zone Authority to conduct this study among the Authority employees was confirmed. Informed consent has been obtained for each participant and the confidentiality and anonymity where guaranteed, and emphasizing that the participating is voluntary; the participant could withdraw at any time during the data collection time. There is no risk on the involved employees and no financial issues in participating in this study. The researcher's phone numbers were mentioned, for any questions, or any help for the participants in filling out the questionnaire.

4 Results

4.1 Demographical Information

The researcher distributed (115) questionnaires among the employees in the Aqaba Special Economic Zone Authority. Only (110) questionnaires were valid for analysis, making the response rate of 96%. The analysis of the demographical characteristic of the sample shows that the mean age of the sample was 27.3 years (SD = 4.96) ranged from (22–45) years. And the average monthly income was ranged between (700 – 2000) JD. With the sample mean 1250 JD. (SD = 350). While the mean of the experience level for the participant was 10 years (SD = 4.5) as represented in Table 2. Furthermore, the Categorical Characteristic of the sample showed in Table 3; which revealed that out of (110) employees participated in this study; almost more than the half of the participants (57%) were male. Almost the half of the employees (47%) has BCS degree in the view of educational levels, and (29%) of the participants were has higher education.

Table 2 Demographical characteristic of the sample (N = 110)

Category	Mean	SD	Rang
Age	27.3 years	4.96	22–45 years
Monthly income	1250 JD	350	700–2000 JD
Experience level	10 years	4.5	2–19 years

Prepared by researcher depend on SPSS results

Table 3 Categorical Socio-demographic information of about the respondents (N = 110)

Category	Component	Frequency	Percentage (%)
Gander	Male	63	57
	Female	47	43
Educational level	School	26	24
	BSC	53	47
	M.A	28	26
	Ph.D.	3	3

Prepared by researcher depend on SPSS results

Table 4 Levels of MAWS and SFMSQ (N = 110)

	Scale	Mean	SD.	Range
1	Motivation at Work Scale (MAWS)	38.4	4.392	33–48
2	Short Form Minnesota Satisfaction Questionnaire (SFMSQ)	62.6	14.87	48–82

Prepared by researcher depend on pilot study results

4.2 The Answers of Research Questions

4.2.1 The First Research Question

To answer the first research question (What are the levels of motivational culture and job satisfaction among the employees in the Aqaba Special Economic Zone Authority?); the researcher analyzes the responses of the participant for the questionnaire of "Motivation of the Work Scale (MAWS)" and "Short Form Minnesota Satisfaction Questionnaire (SFMSQ)", by using the descriptive statistics (mean, standard deviation and frequency). Analyzing the responses of the participating employees to ward "MAWS" shows that the scores were ranged from (33) to (48) and the mean was {38.4 (SD = 4.392)}, which revealed a moderate level of work motivation among the employees in the Aqaba Special Economic Zone Authority. In the anther point of view, the result of participant respondent to ward "SFMSQ" revealed that the scores ranged from (48) to (82) and the mean was {62.6 (SD = 14.87)}, which revealed a moderate level of job satisfaction among the employees in the Aqaba Special Economic Zone Authority, as in Table 4.

4.2.2 The Second Research Question

To answer the second research question (Is there an impact of motivational culture on job satisfaction among the employees in the Aqaba Special Economic Zone

Table 5 Result of regression model for the impact of motivational culture on job satisfaction

Model	F	Sig. F	*R*	R^2
1	20.74	0.001**	0.78	0.61

Prepared by researcher depend on SPSS results

Authority?); the researcher applied simple liner Regression analysis. The regression result Table 5; reveals that the regression equation reaches the significance ($F = 20.74$, $p < 0.001$**). And there was a positive strong significance impact for motivational culture on job satisfaction ($r = 0.78$); the results conclude that (61%) of the job satisfaction could be explained from motivational culture.

5 Discussion and Conclusions

Studying the levels of work motivation among employees in the Aqaba Special Economic Zone Authority reported a moderate level of work motivation {M = 38.4 (SD = 4.392)}. Such a supported result was reported in Indonesia by Bernanthos (2018) during studying the levels of work motivation among employee questionnaire data in Private Universities and report moderate levels of work motivation with mean {39.3(SD = 3.796)} (Bernanthos, 2018). The results of job satisfaction levels indicate a moderate level of job satisfaction among the employees; the mean was {62.6 (SD = 14.87)}. These results were supported by previous studying of job satisfaction levels among employees working at Housekeeping Department in Indonesia and revealed the job satisfaction mean (58.3 (SD = 35.3%) (Rapsanjani & Johannes, 2019).

Furthermore, the results of this study indicate that there a there was a positive strong significance impact for motivational culture on job satisfaction among the employees in the Aqaba Special Economic Zone Authority, this impact can be explaining (61%) of the employee's job satisfaction a result from motivational culture. Such a strongly positive impact motivational culture was reported by Ali and Anwar (2021), by studying the impact of motivational culture on job satisfaction.

This study highlights on the impact of motivational culture on job satisfaction among the employees in the Aqaba Special Economic Zone Authority, and reported that the motivational culture can explain (61%) of the job satisfaction level and indicate that there a significance relationship between motivational culture and the job satisfaction level. This relationship helps the organizations to work more to promote employee job satisfaction high. In addition, the Aqaba Special Economic Zone Authority should offer better services in alignment with the latest Information Systems as suggested by researchers (e.g., Abuhashesh & Al-Dmour, 2018; Al-Dmour et al., 2021; Alshurideh et al., 2021; Davidescu et al., 2020; Lorincová et al., 2019; Madi Odeh et al., 2021; Obeidat et al., 2019; Paais & Pattiruhu, 2020; Pancasila et al., 2020; Pang & Lu, 2018; Rozi & Sunarsi, 2020; Shannak et al., 2012; Sudiardhita et al., 2018; Vanesa et al., 2019; Zureik & Al-Sondos, 2021).

According to the result of the study, employee's motivational level for the whole sample was "moderate", and in the aim to increase this level, the researcher recommended to the human resources managers to increase the behaviors that promote motivational culture by taking into consideration employees' desires and expectations, reinforcing communication within the authority (Al Kurdi et al., 2020; Alameeri et al., 2020; Al-bawaia et al., 2022; AlShehhi et al., 2020; Alsuwaidi et al., 2020; Bettayeb et al., 2020; Kurdi et al., 2020), and establishing open communication channels directly with the employees (Aljumah et al., 2021; Alshurideh, 2022; Alshurideh et al., 2014; Alyammahi et al., 2020; Sweiss et al., 2021). Similar studies can be carried out by comparing governmental and private organizations in the aim of co-operations between the different organizations to increase the levels of motivational level and job satisfaction among the employee (Aburayya et al., 2020; Al-Khayyal et al., 2020; Alshurideh et al., 2012; Alzoubi et al., 2020, 2022).

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Innovation, Entrepreneurship and Leadership

Strategic Leadership and Its Role on Implementing Public Policies in the Government Departments in Karak Governorate

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Abstract The major aim of the study was to examine the impact of strategic leadership on implementing public policies in government departments in Karak Governorate. Therefore, it was focused on government departments in Karak Governorate in Jordan. Data were primarily gathered through questionnaires which were distributed to a random sample of (175) respondent. In total, (175) responses were

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_76

received including (5) invalid to statistical analysis due to uncompleted or inaccurate. Hence, the final sample contained (170) responses. Structural equation modeling (SEM) was conducted to test hypotheses. The study reached the presence of a statistically significant effect of strategic leadership on the implementation of public policies. The study recommended the necessity of paying attention to human capital in government departments in Karak governorate and enhancing interest in ethical practices from major implications in planning activities and processes and participation with stakeholders in providing services and preserving government departments'resources in Karak governorate.

Keywords Strategic leadership · Public policies · Government departments · Karak Governorate · Jordan

1 Introduction

The relationship between the state and the individual has been characterized since its existence by complexity and effective change, which was reflected in the diversity of ideas, and theories that sought to clarify and explain them, and this is represented through the basic role played by the leadership in its strategic concept in paying attention to the organizations development in order to achieve its vision, mission and overall performance (AlTaweel & Al-Hawary, 2021; Mohammad et al., 2020; Al-Hawary & Al-Syasneh, 2020; Alhalalmeh et al., 2020; Al-Hawary & Obiadat, 2021; Al-Quran et al., 2020; Allahow et al., 2018; Alolayyan et al., 2018; Alshurideh et al., 2017; Al-Lozi et al., 2017; Al-Nady et al., 2016; Al-Hawary & Hadad, 2016; Al-Nady et al., 2013; Al-Hawary et al., 2013).

Organizations are greatly affected by the strategic leadership practices (Alameeri et al., 2020; AlShehhi et al., 2020). Indeed, those who chronicle the organizations appear to be chronicling the leadership figures who led these organizations (Al-Dhuhouri et al., 2020; Odeh et al., 2021). Strategic leadership is also concerned with forming strategic decisions that represent the core administrative process in response to the adaptation reality to bring about the required change, taking into account the expectations of individuals and society (Al-Hawary & Mohammed, 2017; Al-Hawary et al., 2012; Al-Hawary, 2009; Harahsheh et al., 2021). The implementation of public policies differs between countries according to production factors reality and the variables related to economic and social ...etc. Based on that, public policies implementation must be based on the executive government apparatus and the administrative component in the different regions of the country. This requires local councils to generate energies and resources to activate this implementation process. Also, achieving the set goals and objectives requires a solid formulation of these policies, in line with the possibility of implementing these policies.

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The importance of the role of strategic leaders in implementing policies by linking the two stages of formulation and implementation of public policies from the reality of local councils in the governorates is not hidden (Allozi et al., 2022; Tariq et al., 2022). The importance of strategic leader's role in implementing policies by linking the two stages of public policies formulation and implementation from the reality of local councils in the governorates is become clear (Alkalha et al., 2012; Zu'bi et al., 2012). The implementing public policies process is considered one of the main pillars of all government departments (Alaali et al., 2021; Alzoubi et al., 2022). Because it is directly related to improving the efficiency and effectiveness of these departments, As a result of the current rapid developments, these developments require the adoption of a management approach based on providing unfamiliar services of high quality; to reach outstanding performance, Jordanian government departments in Karak governorate work like other departments in other governorates, in the face of changing environmental conditions with a high degree of complexity, which calls for the need to adopt effective strategic leadership practices, according to an administrative methodology, focused on achieving excellence in sustainable performance, which is based on creating lower cost services,

Relying on the formulation and implementation of the general policy related to each department and its dissemination, public resources planning and mobilization, especially the scarce ones, and stakeholders' participation and achievement that enable them to adapt to the emerging changes that affect government departments in light of the threats they face (Alshurideh et al., 2019a, 2022). In general, these departments success requires keeping pace with strategic leadership practices in their developments. Because it is one of the important tools that enable these departments to deal with the environmental uncertainty, and it is considered one of the important factors in supporting, coordinating and unifying all efforts in order to achieve the strategic goals efficiently and effectively (Aburayya et al., 2020; Alshurideh et al., 2019b). Accordingly, the purpose consistent with this study is to show the role of strategic leadership practices on implementing public policies in government departments in Karak Governorate.

2 Literature Review and Hypotheses Development

2.1 Strategic Leadership

There are many definitions and concepts according to the researchers view to leadership and its concepts, but there is no specific agreement about its concept, or even general agreement about leadership component, as some researchers focused on leadership as the outcome of interaction between the leader, subordinates and the situation as a continuous process (Meuser et al., 2016; Batayneh et al., 2021), There are many definitions of strategic leadership with the multiplicity of functions it performs, where strategic leadership is defined as the leader's ability to visualize future visions, deep

strategic thinking, identify environmental changes that will affect the level of organization continuous improvement, and work with others to take the necessary actions to achieve a better future., while maintaining flexibility in implementation, reviewing and evaluating tasks and procedures (Alyammahi et al., 2020). It is also defined by Ratanasongtham and Ussahawanitchakit (2015) as leadership that possesses the ability to predict, visualize, maintain flexibility, empower others, develop competencies and capabilities, improve organizational structures, and choose to develop the next leader's generation of leader, sustain an effective organizational culture, and emphasize ethical practices. While Al-Nafar (2015) referred to strategic leadership as the leadership capable of developing a clear and appropriate strategic vision based on strategic objectives in accordance with an appropriate organizational culture in order to develop a human cadre that is characterized by values, ethics, innovation, and flexibility that works to bring about change and continuous development that leads to excellence and uniqueness. Looking at the previous definitions of strategic leadership concept, it becomes clear that strategic leadership focuses on a set of activities and operations, including determining the organization current situation, formulating the organization strategic direction, strategic alliances, implementing change and making strategic decisions to ensure the organization's growth and continuity, improving its outputs, and achieving its desired goals (Ahmad et al., 2021; Al-Dmour et al., 2021).

According to what was indicated by Muwafaq, the strategic leadership importance lies in the fact that it contributes to: building the organization's strategy, achieving long-term success and prosperity, and enhancing the continuous competitive advantage. Poor strategic leadership practices cause the organization to lose focus on defining long-term direction. Strategic leadership enhances the ability to deal with different types of individuals personalities inside and outside the organization, and coordinate with parties that did not interact in the first place, in addition to enhancing commitment and participation, and confirming the ethical model in organizational relations, with consideration of strategic leadership as the organization representative and its negotiator in dealing with relevant external agencies, entities, and organizations (Ashal et al., 2021; Ben-Abdallah et al., 2022).

What distinguishes strategic leadership is that it has an impact that extends outside the functional scope of the leader and business units, and sometimes outside the organization, which means that the organization is a strongly interconnected system, as decisions taken in one part of the business units affect other parts of the organization, and the impact of strategic leadership extends to long period of time, The strategic leader keeps long-term goals in his mind, and works to achieve short-term goals derived from long-term goals, which requires balancing and harmonizing these two types of organizational goals (Njeri, 2017). The strategic leader keeps long-term goals in his mind, and works to achieve short-term goals derived from long-term goals, which requires balancing and harmonizing these two types of organizational goals (Njeri, 2017).

There are a number of strategic leadership practices that were dealt with by researchers and constituted a basic requirement for this type of leadership. The researcher decided to address a number of them in agreement with the study population, which are as follows: Strategic direction: It refers to the general path chosen by

the organization to achieve its strategic goals, taking into account the external environment conditions in which it is active, and its available resources while adhering to the available capabilities. Human capital: It refers to the processes related to training, education, and other professional initiatives in order to increase the knowledge level, skills, abilities, values, and employee's social assets that leads to employee satisfaction and performance (Ukenna et al., 2010). Ethical practices: They refer to a set of foundations, standards and principles that are the basis for the proper behavior that individuals must undertake to abide by at work (Al-Aqili, 2014). It is also referred to as a practical framework for decision-making and it serves as a means to refine and evaluate practices, because it reflects a set of standards, values, and ethical principles that guide the behavior and actions of employees. Strategic control: it is defined as an administrative process that seeks to detect deviations, whether positive or negative, with the aim of correcting them, taking into account if everything is done in accordance with established plans, instructions issued, and applicable principles. It includes all the organization moral and material parts (Reza, 2011).

2.2 Public Policies Implementation

Public policies have kept pace with developments in the social sciences fields such as economics, management and politics, as a scientific field that intersects with all these sciences. Therefore, researchers, experts, academics and leaders have been interested in the issue of public policies because of its great importance at the institutions, public organizations and government's levels. There are many definitions of public policies to include all aspects of decisions issued by the government, or which it authorizes in order to fulfill societal demands. The public policies approved and implemented by the political system are characterized by diversity and comprehensiveness that affects all community life. Therefore, public policy has been defined as a set of plans, programs, decisions and activities resulting from the official authorities to solve current and future problems in all sectors. It is issued in the form of decisions, laws and regulations with the allocation of financial and technical resources to achieve the public interest (Salihi, 2019). Public policy is what the government does or intends to do to solve a general problem facing the community in order to provide the community required needs, It is an organized effort aimed at analyzing, understanding and evaluating how the government dose its role in serving the community, and improving the government performance efficiency (Altamony et al., 2012; Farghaly, 2019). implementing public policies importance came from the fact that it helps in obtaining more knowledge about its sources, stages, active contributors, its importance, and its effects on society, and a deeper understanding of society and its needs through knowledge of the foundations and results of public policy programs, and this deepening course increases the understanding of the relationship between the political system and its society. There is a set of dimensions that constitute the implementation of public policies structure, and in many cases they are closely interconnected, and the separation of one of them constitutes a flaw in

the implementation of the rest of the dimensions in a way that achieves their implementation effectiveness. The researcher decided to address a number of dimensions that, the researcher formed dimensions that are closely related to the study population. They were addressed as follows: public policy Formulation and dissemination: This process represents the activities that take place before they are announced by the government, and according to what (Ikelegbe mentioned, 2005), said it includes defining the problem related to the policy, developing, analyzing alternatives and selecting the appropriate alternatives for implementation. Planning for implementation and moving resources): Planning and resource mobilization are referred to as contemplation, reflection and insight into the past, present and future, and study the size of required policies and required resources availability through which this can be implemented (Hussain and Jassim, 2017). Stakeholders Participation: (Freeman, 1984) define stakeholders as an individual or group that influences by the organization's achievement of its objectives. It is noteworthy that the policy that is effectively developed without the intervention of the capital owner may lead to difficulty in implementation because it does not reflect the actual needs and does not take into account the feelings of the shareholders and owners who may contribute to the policy implementation (Klein & Knight, 2005).

2.3 Strategic Leadership and Its Role in Implementing Public Policies

Boal and Schultzy (2007) emphasizes that strategic leadership is a critical element in developing the organizational capabilities through opportunities and avoiding threats in a timely manner, Strategic leadership helps in making strategic decisions, creating and communicating the future vision, developing structures, activating oversight and organizational processes, maintaining an effective organizational culture, and spreading the ethical values system in the organization culture. According to Muwafaq, the strategic leadership importance lies in the fact that it contributes to: building the organization's strategy, achieving long-term success, and enhancing the continuous competitive advantage. And that the strategic leadership practices weakness makes the organization lose focus on determining the long-term direction. Strategic leadership enhances the ability to deal with different types of individuals personalities inside and outside the organization, and coordinate with parties that did not interact in the first place, in addition to enhancing commitment and participation, and confirming the ethical model in organizational relations, with consideration of strategic leadership as the representative of the organization and its negotiator in dealing with relevant external agencies, bodies, and organizations. Al-Arif pointed to strategic leadership importance in the process of evaluating organizational performance, through balanced control of decisions, directions, and what it does in providing advice and guidance. As for Al-Qaryouti (2006), says that public

policy helps in identifying the activities and programs undertaken by the government and their results, and public policy helps in analyzing and formulating policies, providing alternatives and solutions to the problems presented, and implementing them. In addition to assisting the government in adopting successful policies to achieve the planned goals, it also works to improve the knowledge of the problems facing society through scientific diagnosis of these problems and educating politicians with the latest methods used in the process of developing, implementing and evaluating public policies. In addition to identifying the determinants that benefit the government in the process of drawing up and implementing public policy, in order to seek a greater understanding of its role, assistance in predicting foreign public policies that affect internal policies, taking precautions for them, and assisting the government in setting programs and public policies that can receive affirmation and support. Based on what was discussed, the study hypothesis can be formulated as follows:

There is a statistically significant impact of the strategic leadership practices on the implementation of public policies in government departments in Karak Governorate.

3 Study Model

See Fig. 1.

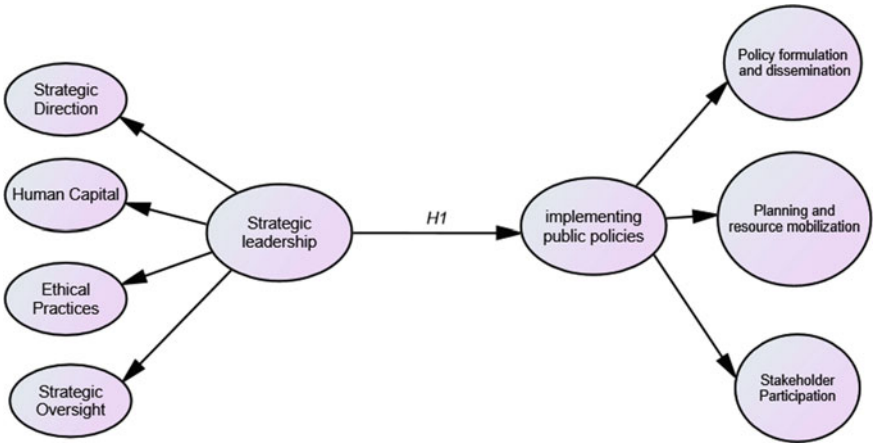

Fig. 1 Research model

4 Methodology

4.1 Population and Sample Selection

A qualitative method based on a questionnaire was used in this study for data collection and sample selection. The major aim of the study was to examine the impact of strategic leadership on implementing public policies in government departments in Karak Governorate. Therefore, it was focused on government departments in Karak Governorate in Jordan. Data were primarily gathered through questionnaires which were distributed to a random sample of (175) respondent. In total, (175) responses were received including (5) invalid to statistical analysis due to uncompleted or inaccurate. Hence, the final sample contained (170) responses suitable to analysis requirements that were formed a response rate of 97.86) %) where it proved to be sufficient to the extent that was predictable and allowed for a presumption of data saturation (Sekaran & Bougie, 2016).

4.2 Measurement Instrument

A questionnaire consists of two main sections along with a section regarding control variables was used as the measurement instrument. Control variables considered as categorical measures were composed of gender, age, educational level, and experience. The two main sections were dealt with a five-point Likert scale (from 1 = strongly disagree to 5 = strongly agree). The first section contained (19) items to measure strategic leadership based on Kabetu and Iravo, Kitonga et al. These questions were distributed into dimensions as follows: five items dedicated for measuring strategic direction, four items dedicated for measuring human capital, five items dedicated for measuring ethical practices, and five items dedicated for measuring strategic oversight. Whereas the second section included (14) items developed to measure implementation of public policy according to what was pointed by Mthethwa, Khan, Marume. This variable was divided into three dimensions: policy formulation and dissemination that was measured through four items, planning and resource mobilization which measured by five items, and stakeholder participationwas measured using five items.

5 Findings

5.1 Measurement Model Evaluation

This study was conducted structural equation modeling (SEM) to test hypotheses, which represents a contemporary statistical technique for testing and estimating the relationship between factors and variables (Wang & Rhemtulla, 2021). Accordingly, the reliability and validity of the constructs were tested using confirmatory factor analysis (CFA) through the statistical program AMOSv25. Table 1 summarizes the results of convergent and discriminant validity, as well the indicators of reliability.

Table 1 shows that the standard loading values for the individual items were within the domain (0.620–0.895), these values greater than the minimum retention of the elements based on their standard loads (Al-Lozi et al., 2018; Sung et al., 2019). Average variance extracted (AVE) is a summary indicator of the convergent validity of constructs that must be above 0.50 (Howard, 2018). The results indicate that the AVE values were greater than 0.50 for all constructs, thus the used measurement model has an appropriate convergent validity. Rimkeviciene et al. (2017) suggested the comparison approach as a way to deal with discriminant validity assessment in covariance-based SEM. This approach is based on comparing the values of maximum shared variance (MSV) with the values of AVE, as well as comparing the values of square root of AVE ($\sqrt{}$AVE) with the correlation between the rest of the structures. The results show that the values of MSV were smaller than the values of AVE, and that the values of $\sqrt{}$AVE were higher than the correlation values among the rest of the constructs. Therefore, the measurement model used is characterized by discriminative validity. The internal consistency measured through Cronbach's Alpha coefficient (α) and compound reliability by McDonald's Omega coefficient (ω) was conducted as indicators to evaluate measurement model. The results listed in Table 1 demonstrated that both values of Cronbach's Alpha coefficient and McDonald's Omega coefficient were greater than 0.70, which is the lowest limit for judging on measurement reliability (De Leeuw et al., 2019).

5.2 Structural Model

The structural model illustrated no multicollinearity issue among predictor constructs because variance inflation factor (VIF) values are below the threshold of 5, as shown in Table 1 (Hair et al., 2017). This result is supported by the values of model fit indices shown in (Figs. 1 and 2).

The results in Fig. 1 indicated that the chi-square to degrees of freedom (CMIN/DF) was 2.199, which is less than 3 the upper limit of this indicator. The values of the goodness of fit index (GFI), the comparative fit index (CFI), and the Tucker-Lewis index (TLI) were upper than the minimum accepted threshold of 0.90.

Table 1 Results of validity and reliability tests

Constructs	1	2	3	4	5	6	7
1. SD	**0.766**						
2. HC	0.556	**0.782**					
3. EP	0.587	0.633	**0.768**				
4. SO	0.598	0.678	0.521	**0.785**			
5. PFAD	0.578	0.574	0.673	0.699	**0.757**		
6. PARM	0.784	0.682	0.695	0.752	0.683	**0.759**	
7. SP	0.794	0.622	0.605	0.759	0.761	0.709	**0.787**
VIF	3.195	3.017	2.960	2.779	–	–	–
Loadingsrange	0.805–0.849	0.782–0.822	0.758–0.847	0.705–0.884	0.826–0.891	0.620–0.895	0.750–0.890
AVE	0.868	0.731	0.850	0.860	0.839	0.826	0.813
MSV	0.614	0.549	0.543	0.497	0.556	0.485	0.469
Internal consistency	0.884	0.823	0.858	0.883	0.894	0.693	0.753
Composite reliability	0.748	0.865	0.874	0.905	0.911	0.945	0.877

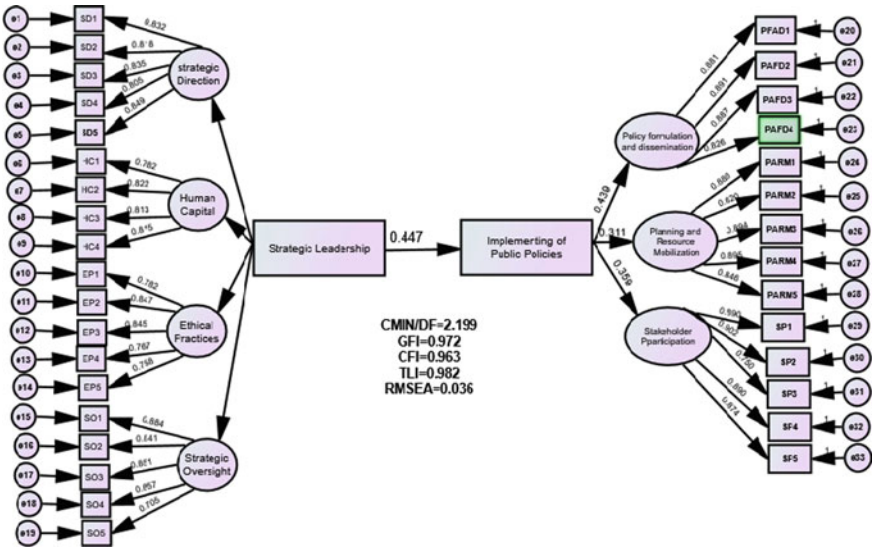

Fig. 2 SEM results of the digital marketing effect on mental image

Moreover, the result of root mean square error of approximation (RMSEA) indicated to value 0.036, this value is a reasonable error of approximation because it is less than the higher limit of 0.08. Consequently, the structural model used in this study was recognized as a fit model for predicting the DEP and generalization of its result (Ahmad et al., 2016; Shi et al., 2019). To verify the results of testing the study hypotheses, structural equation modeling (SEM) was used, the results of which are listed in Table 2.

The results demonstrated in Table 2 show that all strategic leadership practices have a positive impact relationship on implementing public policies except human capital and ethical practices which have no impact on implementation public policies ($\beta = 121$, $t = 1.207$, $p = 0.229$ and $\beta = 0.068$, $t = 0.682$, $p = 0.496$). However, the results

Table 2 Hypothesis testing

Hypothesis	Relation	Standard beta	*t* value	*p* value
H1	strategic direction→implementing public policies	0.355	3.242	0.001
H2	Human capital→implementing public policies	0.121	1.207	0.229
H3	Ethical practices→implementing public policies	0.068	0.682	0.496
H4	Strategic Oversight→implementing public policies	0.333	3.447	0.001

Note * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

indicated that the highest impact was for Strategic Oversight ($\beta = 0.35533$, $t = 3.447$, $p = 0.001$), followed by socialization ($\beta = 0.285$, $t = 4.781$, $p = 0.000$), and finally the lowest impact was for strategic direction ($\beta = 0.335$, $t = 3.242$, $p = 0.001$).

6 Discussions

The study results showed that leaders in government departments in Karak governorate carry out strategic leadership practices related to their departments in the governorate according to their priorities, this is due to the leaders keenness to achieve the strategic direction of the departments with their commitment to implement the laws and regulations governing the activities and operations. These leaders are also keen to apply ethical practices and pay attention to human capital as it represents the basis for these departments, The results of the study confirmed the ability of leaders in government departments affiliated to the governor of Karak to determine their objectives clarity in addressing the expected problems to implement the public policy that has been formulated, and the adoption of various strategies in formulating objectives when formulating public policies in the governorate so that these public policies adopted by leaders lead In the government departments in Karak governorate, new programs should be set up so that the beneficiaries are aware of their benefits. It also shows the leaders keenness in government departments in Karak governorate to plan for potential changes in public policies, work systems and procedures, with their ability to draw plans in their departments according to the capabilities to implement public policy.

The results indicated the leaders' interest in the aspects related to the stakeholder's participation and related to their keenness on effective communication with the audience and employees, with the leaders' awareness of the public needs analyzing importance according to time, and their keenness to receive complaints and work to resolve them with the general policy unconfident. The results revealed a statistically significant impact of the general strategic leadership practices on public policies in government departments in Karak Governorate. This result can be explained by the adoption of government departments in Karak governorate to the strategic leadership practices represented in strategic direction and strategic control, This reinforces two dimensions of strategic leadership, one related to the strategic vision of government departments, and the other dimension is related to the strategic control process, which means the process of control and oversight in government departments in the governorate so that they are able to face challenges, anticipate the future and take advantage of opportunities.

The results also indicated that the government departments in the Karak governorate were able to draw up, formulate and publish the general policy, in line with the complementary and coordinating viewpoint between the various government departments in the Karak governorate. The results indicated that the government adoption of strategic direction dimensions and strategic control ensures the achievement of these departments aspirations to exploit resources in a high degree, based on their

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scarcity and decline, which requires careful vision and organizational control over all available resources and the possibility of using them to meet citizens needs and desires in Karak Governorate. The government departments in the Karak governorate does their internal functions and operations and link them to citizen's needs, desires and tendencies, in accordance with the stakeholders in the governorate, and based on strategic plans prepared in partnership with stakeholders and civil society organizations in Karak governorate. This result is consistent with Al-Amri and Al-Janabi (2020), which indicated that there is an impact of strategic leadership practices in avoiding strategic pitfalls, and Juma's study (2019), which showed that there is an impact of strategic leadership practices in enhancing strategic performance, and also agreed with the study.

7 Recommendations

Based on the previous results, the study recommends the need to pay attention to human capital in government departments in Karak governorate, as it represents one of the strategic leadership practices because of its reflection on the quality of services provided by employees and that its efficiency enhances interest in public policy formulation, planning, resource mobilization and the participation of stakeholders in Karak governorate. The study also recommends the need to enhance attention to ethical practices in government departments in Karak governorate because of their great repercussions in activities and planning processes and participation with stakeholders in providing services and preserving government departments' materials in Karak governorate, also the need to enhance stakeholders participation when formulating public policies, as these parties are part of the work environment of these departments, and these departments success lies in the extent of their stakeholders participation.

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The Impact of Innovative Leadership on the Strategic Intelligence in the Insurance Companies in Jordan

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Abstract The aim of the study was to examine the impact of innovative leadership practices on strategic intelligence in insurance companies in Jordan. Data were primarily gathered through the questionnaires which were distributed to the managers of the different levels. In total, (256) responses were received including (18) invalid

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_77

to statistical analysis due to uncompleted or inaccurate. Hence, the final questionnaires contained (238) responses suitable to analysis requirements. Structural equation modeling (SEM) was conducted to test hypotheses. The results showed that all innovative leadership dimensions have a positive impact relationship on strategic intelligence except changeability which has no impact on Strategic Intelligence. Based on the study results, managers and decision makers of insurance companies have to instill enthusiasm and courage in employees, allowing them to express themselves more freely, with follow-up to identify complaints that may arise from a lack of knowledge or a lack of coordination or integration between departments and units at the institutional level.

Keywords Innovative leadership · The strategic intelligence · Insurance companies · Jordan

1 Introduction

The link between leadership and innovation is important in the success of the continuation of innovative processes within society and in the development and creation of the creative climate (Alameeri et al., 2020; AlShehhi et al., 2020; Odeh et al., 2021). Innovative leaders are not only satisfied with rearranging existing structures but are motivated by the continuous quest to find a better way (Al-Dhuhouri et al., 2020; Harahsheh et al., 2021). The innovative leadership style is discovery and self-renewal and their impact contributes to achieving the broader interest and raises the awareness of leadership, followers and the institution as a whole (Al-Hawary, 2009; Al-Hawary et al., 2012; Alzoubi et al., 2022). Innovation gives leadership characteristics that distinguish it from other leaders, such as openness towards change, the desire to identify internal problems and issues, in addition to giving the ability to control the environment in which he lives, confidence in the ability of others to achieve and bear responsibility, respect for others' choices, and the ability to rush towards learning and using culture, appreciating the achievements of others, and moving towards the future with full force (Mohammad et al., 2020; Al-Hawary & Mohammed, 2017; Al-Zubaidi et al., 2015). The communications and information technology revolution has contributed to unprecedented scientific, cultural, and technological developments in human history. To keep up with these developments, institutions of all kinds and orientations are reviewing their policies, objectives, technologies, and activities related to creativity, change, and continuous improvement of their services and products (Al-Hawary & Ismael, 2010; Al-Hawary et al., 2013; Al-Nady et al., 2013; Al-Hawary & Hadad, 2016; Al-Nady et al., 2016; Al-Lozi et al., 2017; Allahow et al., 2018; Al-Hawary & Al-Syasneh, 2020; Al-Hawary et al., 2020a,

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2020b; Al-Hawary & Alhajri, 2020; Al- Quran et al., 2020; Alhalalmeh et al., 2020; Al-Hawary & Obiadat, 2021; AlTaweel & Al-Hawary, 2021; Alshurideh et al., 2022).

Organizations must prepare leaders and provide them with the skills they need to complete the responsibilities entrusted to them to the best of their abilities and achieve the organization's goals and objectives (Mohammad et al., 2020; Al-Hawary et al., 2012; Al-Hawary, 2009; Al-Hawary & Mohammed, 2017; Al-Hawary & Al-Hamwan, 2017). Monitoring the developments in developed countries shows that institutions were able to overcome all obstacles by encouraging creative practices and putting them into practice on the ground, as well as updating the various methods of work that were a reason for countries' superiority and progress, provided that these methods and tools were adapted to suit Arab environments.

Strategic intelligence was named one of the types of intelligence that anchors leadership traits, then finding creative leaders, especially in light of the growing importance of leadership in institutions and reliance on traits (intelligence, mind, and personality) in judging the efficiency of leaders (Al-Hawary & Hadad, 2016; Allozi et al., 2022). The true responsibility of the innovative leader is to uncover and invest his followers' innovative energies, as well as to work to ensure that his organization learns innovation and creativity on a constant basis. In general, the performance of these institutions depends on keeping up with new strategic management advancements. Strategic intelligence is also considered an advanced field; it is one of the most important tools for these institutions to deal with the environmental uncertainty they face, and it is a key factor in supporting and coordinating all efforts to unite them in order to achieve strategic goals efficiently and effectively (Al Kurdi et al., 2020; Alshurideh, 2022; Alsuwaidi et al., 2020; Kurdi et al., 2020). The study mainly aimed to determine the role that innovative Leadership plays on enhancing strategic intelligence.

2 Theoretical Framework and Hypotheses Development

2.1 Innovative Leadership

It is clear that the innovative leadership in the organization is the innovator who translates knowledge into choices and who has ideas that are new and useful and related to solving specific problems or re-combining known patterns in unique forms. Innovative leadership is the ability to change, renew or create a new approach or style, and use it with techniques. It is noticeable that innovative leadership contains all the characteristics of these styles, but each of them quotes a characteristic or advantage of the innovative leadership. Innovative leadership is also defined as working continuously to influence employees and convince them to accept work in order to achieve the goals of the organization according to the method determined by the innovative leader who can Re-dissolving the differences and contradictions between work goals

and the goals of the institution (Bilton, 2010; Al Mehrez et al., 2020; Al Naqbi et al., 2020; Al Suwaidi et al., 2020; Nuseir et al., 2021; Lee et al., 2022a, 2022b).

Carr defined innovative leadership as the ability to change, renew or introduce a new approach or method, and use it with modern technologies that fit with the requirements of the environment and the aspirations of the modern era and meet the needs of institutions and society together. Al-Baz (2012) defines it as the innovator who translates knowledge into new choices and who has ideas that are new, useful and related to solving specific problems or re-combining known patterns of knowledge in unique forms, while Eid refers to it as "leadership that pursues an unconventional approach." in the development of the institution, in order to achieve continuous adaptation to the changes accompanying the field of work at the local and international levels, and those who practice it possess special characteristics and skills that are compatible with the requirements of applying modern trends in management." Innovative leadership has a set of basic features that appear to influence the behavior of leaders, and for the purposes of this study the following dimensions were adopted:

Problem solving and decision-making: This refers to the ability to comprehend and comprehend what is truly going on in a scenario, including other people's behaviors and feelings. An understanding of what is going on in daily events in a way that aids productivity, followed by the ability to act successfully in response to those conditions. **Changeability**: by generating novel ideas and recommendations for scenarios in which the institution must follow certain administrative guidelines in order to accomplish self-renewal and gain a competitive edge (Al-Jafra, 2013). **Initiative** is a trait of a creative leader that fosters initiative, hires creative individuals, encourages healthy and ethical competition, and does not suffocate excitement and originality with oppression and professional envy. **The ability to communicate** entails devising the most effective methods for identifying ideas, information, and directions by establishing a social structure in which opinions, trends, and knowledge are formed (Alyammahi et al., 2020; Sweiss et al., 2021). **Stimulating creativity**: a paragraph about a mental trait that allows an individual to think in unique ways, and this necessitates thorough preparation by the institution's upper management (Al-Zubaidi et al., 2015). **Creative knowledge**: This is the knowledge that enables a company to lead its industry.

2.2 Strategic Intelligence

Strategic intelligence is defined as "a systematic and ongoing process of producing smart information necessary for an organization's activity that is characterized by its strategic value and in an actionable form to aid long-term decision-making" (Ahmadi et al., 2020). It's also known as the essential competences required to make decisions that affect an institution's future and capacity to compete with others. This process qualifies its owner to have a set of synergistic analytical skills that leaders in organizations use in general to improve their ability to identify and understand

systems, predict their behavior, and devise modifications to them in order to produce the desired effects, as these skills work together as a system, to help them with future aspirations that determine the nature of business future that the organization wants to achieve based on the environment i.e. It encourages firms to form cooperative partnerships in order to find investment possibilities, improve the quality of their products, or increase the efficiency of their operations.

Strategic intelligence is the delivery of the correct information to the appropriate people at the right time so that they may make the best and most practical decisions for the organization's future (Muslim & Qader, 2015). Basadur (2014) defined strategic intelligence as an aggregate formula for multiple sorts of skills in the context of determining the most efficient and effective ways for the institution's position to deal with future challenges and opportunities. Several studies looked into the various aspects of the idea of strategic intelligence, with the following being the most common: **Systems thinking**: It refers to the individuals' ability to deal with a group of variables, address them or research their relationship, and analyze them in a way that helps them explain their causes and outcomes and profit from them in attaining the overall goals that the institution tries to achieve is referred to as systems thinking (Al-Sheikhly, and Ibrahim, 2015). **Strategic vision** is a set of concepts for driving company development operations that is usually contained in a document or statement so that all management of the organization can share the same vision and make decisions based on common principles and the firm's mission (Yanez, Uruburu, Moreno & Lumbreras, 2019). An agreement between two or more institutions to collaborate and exchange material and/or intellectual resources is referred to as a **strategic partnership**, and their relationship is formalized through an employment contract. This form of agreement is designed to assist both parties in achieving their objectives (Kaur et al., 2019).

2.3 Innovative Leadership and Strategic Intelligence

Strategic intelligence is seen as the organization's protective shield, as it is involved in every stage of the organization's strategies and activities., and relying on the traits (intelligence, mind, and personality) in judging the efficiency of its leaders, as well as the leaders' need to enjoy different types of intelligence and employ them in adapting to new technology, the emergence of employment and information patterns (such as the internet). Innovative leaders no longer rely on a single sort of intelligence; instead, they must diversify the types of intelligence rather than relying on a single model to assess intelligence efficiency.

The responsibility of leading the institution in an innovative manner is placed on the shoulders of higher leadership, which necessitates all of the characteristics of sharp and strategic intelligence. No single leader can take on all issues and topics and manage them from the top, so the true role of the creative leader is to reveal creative energies to subordinates, invest them, and work to teach his organization to learn innovation. Organizations must adopt the concept of a good and modern leadership

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style, which is accomplished through attracting and employing highly skilled leaders, as well as establishing fair processes for evaluating their performance and providing suitable incentives.

In general, organizational success necessitates keeping up with changes in the world of leadership and implementing them efficiently and successfully as a work strategy. Obtaining advanced positions in leadership, global competitiveness indicators, liberating employees' creative and intellectual powers, allowing for positive engagement, and developing the spirit of collaboration and, within organizations, innovative leadership is regarded as a critical component that must not be overlooked. In one way or another, innovative leadership helps the institution improve its performance. The relevance of innovative leadership in working on the organization's continual development and progress by promoting and supporting the leader's presentation of new ideas, facilitating the institution's work with external parties, given that the leader has special skills that enable him to understand with the various external parties that the institution deals with, read expectations distinctly from competitors, and possess a vision that supports creativity, which provides opportunities and the ability to discover products or new services (Al-Nashar, 2018).

Strategic intelligence is a tool for providing comprehensive information on the external environment to senior decision-makers in a timely manner to support the strategy development process, and the reasons for strategic intelligence's increasing importance in supporting the decision-making process are discussed (Al Abdali et al., 2012). Zhang, Siribanpitak, and Charoenkul (2018) discovered a link between creative leadership strategies and encouraging innovation among Chinese teachers, while Abd, Abbas, and Khudair discovered an effect of strategic management practices on organizational leadership through strategic intelligence, which was confirmed by Tham and Kim (2002) that strategic intelligence is important because it is part of the organization's culture, and it improves the culture of teamwork and sharing information by preparing information for all departments and allowing management and employees to contribute their perspectives on the future by involving them in decision-making.

Organizations that apply the most strategic intelligence will undoubtedly achieve excellence, sustainability, and performance excellence, as strategic intelligence plays an important role in solving problems, removing barriers and restrictions, and structural reorganization, which aids in development and change to keep pace with the demands of the environment, and plays a fundamental role in improving the situation, the growth and development of intangible assets, which are among the most essential resources of any firm, the competitiveness of companies. Those interested in strategic intelligence have also done a lot of research and study in the subject of intelligence. Because of its significance, previous research has found a statistically significant relationship between strategic intelligence practices and organizational ingenuity, as well as a relationship between senior leaders' strategic intelligence and promoting organizational excellence among academic leaders at Hamdania University. Accordingly, the study hypothesis can be formulated as follows:

There is a statistically significant effect of creative leadership on strategic intelligence.

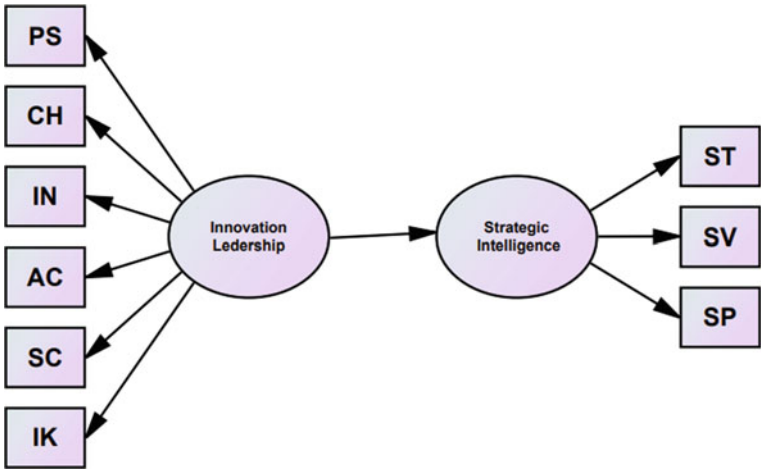

Fig. 1 Research Model

3 Study Model

See (Fig. 1).

4 Methodology

4.1 Population and Sample Selection

A quantitative method based on a questionnaire was used in this study for data collection and sample selection. The aim of the study was to examine the impact of innovative leadership practices on strategic intelligence in insurance companies in Jordan. Data were primarily gathered through the questionnaires which were distributed to the managers of the different levels. In total, (256) responses were received including (18) invalid to statistical analysis due to uncompleted or inaccurate. Hence, the final questionnaires contained (238) responses suitable to analysis requirements., where it proved to be sufficient to the extent that was predictable and allowed for a presumption of data saturation (Sekaran & Bougie, 2016).

4.2 Measurement Instrument

A questionnaire that consists of two main sections along with a section regarding control variables was used as the measurement instrument. Control variables considered as categorical measures were composed of gender, age group, educational level, and experience. The two main sections were dealt with a five-point Likert scale (from 1 = strongly disagree to 5 = strongly agree). The first section contained (24) items to measure innovative leadership based on (Zhang et al., 2018). These questions were distributed into dimensions as follows: four items dedicated for measuring problems solving and decisions making, four items dedicated for measuring changeability, four items dedicated for measuring initiate, four items dedicated for measuring ability to communicate, four items dedicated for measuring stimulating creativity and four items dedicated for measuring innovative knowledge. Whereas the second section included (9) items developed to measure strategic intelligence according to what was pointed by (Ahmadi et al., 2020). This variable was divided into three dimensions: systems thinking that was measured through three items, strategic vision which measured by three items and strategic partnership was measured using three items.

5 Findings

5.1 Measurement Model Evaluation

This study was conducted structural equation modeling (SEM) to test hypotheses, which represents a contemporary statistical technique for testing and estimating the relationship between factors and variables (Wang & Rhemtulla, 2021). Accordingly, the reliability and validity of the constructs were tested using confirmatory factor analysis (CFA) through the statistical program AMOSv24. Table 1 summarizes the results of convergent and discriminant validity, as well the indicators of reliability.

Table 1 shows that the standard loading values for the individual items were within the domain (0.518–0.661), these values greater than the minimum retention of the elements based on their standard loads (Al-Lozi et al., 2018; Sung et al., 2019). Average variance extracted (AVE) is a summary indicator of the convergent validity of constructs that must be above 0.50 (Howard, 2018). The results indicate that the AVE values were greater than 0.50 for all constructs, thus the used measurement model has an appropriate convergent validity. Rimkeviciene et al. (2017) suggested the comparison approach as a way to deal with discriminant validity assessment in covariance-based SEM. This approach is based on comparing the values of maximum shared variance (MSV) with the values of AVE, as well as comparing the values of square root of AVE ($\sqrt{}$AVE) with the correlation between the rest of the structures. The results show that the values of MSV were smaller than the values of AVE, and that the values of $\sqrt{}$AVE were higher than the correlation values among the rest of the constructs. Therefore, the measurement model used is characterized by

Table 1 Results of validity and reliability tests

Constructs	1	2	3	4	5	6	7	8	9
1. PS	–								
2. CH	0.54	–							
3. IN	0.62	0.57	–						
4. AC	0.82	0.80	0.84	–					
5. SC	0.59	0.62	0.55	0.69	–				
6. IK	0.61	0.48	0.61	0.67	0.57	–			
7. ST	0.62	0.51	0.63	0.63	0.69	0.58	–		
8. SV	0.69	0.61	0.68	0.78	0.82	0.76	0.765	–	
9. SP	0.45	0.55	0.42	0.62	0.74	0.44	0.749	0.782	–
VIF	2.580	2.384	1.777	1.460	1.670	1.884	–	–	
Loadings range	0.578–0.827	0.644–0.858	0.665–0.750	0.518–0.661	0.674–0.752	0.568–0.777	0.599–0.887	0.758–0.859	0.634–0.735
AVE	0.733	0.759	0.719	0695	0.789	0.755	0.719	0.733	0.795
MSV	0.511	0.588	0.596	0.522	0.644	0.616	0.559	0.537	0.619
Internal consistency	0.866	0.915	0.845	0.844	0.839	0.822	0.849	0.833	0.852
Composite reliability	0.829	0.844	0.856	0.878	0.899	0.883	0.878	0.859	0.849

Note PS: problems solving and decisions making, CH: changeability, IN: initiate, AC: ability to communicate, SC: stimulating creativity, IK: innovative knowledge, ST: systems thinking, SV: strategic vision, SP:strategic partnership, bold fonts in the table indicate to root square of AVE

discriminative validity. The internal consistency measured through Cronbach's Alpha coefficient (α) and compound reliability by McDonald's Omega coefficient (ω) was conducted as indicators to evaluate measurement model. The results listed in Table 1 demonstrated that both values of Cronbach's Alpha coefficient and McDonald's Omega coefficient were greater than 0.70, which is the lowest limit for judging on measurement reliability (de Leeuw et al., 2019).

5.2 Structural Model

The structural model illustrated no multicollinearity issue among predictor constructs because variance inflation factor (VIF) values are below the threshold of 5, as shown in Table 1 (Hair et al., 2017).This result is supported by the values of model fit indices shown in Fig. 1.

The results in Fig. 1 indicated that the chi-square to degrees of freedom (CMIN/DF) was 2.198 which is less than 3 the upper limit of this indicator. The values of the goodness of fit index (GFI), the comparative fit index (CFI), and the Tucker-Lewis index (TLI) were upper than the minimum accepted threshold of 0.90. Moreover, the result of root mean square error of approximation (RMSEA) indicated to value 0.046, this value is a reasonable error of approximation because it is less than the higher limit of 0.08. Consequently, the structural model used in this study was recognized as a fit model for predicting the DEP and generalization of its result (Ahmad et al., 2016; Shi et al., 2019).To verify the results of testing the study hypotheses, structural equation modeling (SEM) was used, the results of which are listed in Table 2 (Fig. 2).

The results demonstrated in Table 2 show that all innovative leadership dimensions have a positive impact relationship on strategic intelligenceexcept changeability which has no impact on Strategic Intelligence ($\beta = 0.048$, $t = 1.002$, $p = 0.317$)

Table 2 Hypothesis testing

Hypothesis	Relation	Standard beta	*t* value	*p* value
H1	Problems solving and decisions making → Strategic Intelligence	0.214	*5.335	0.000
H2	Changeability → Strategic Intelligence	0.048	1.002	0.317
H3	Initiate → Strategic Intelligence	0.134	*2.913	0.004
H4	Ability to communicate → Strategic Intelligence	0.093	1.557	0.061
H5	Stimulating creativity → Strategic Intelligence	0.124	*2.446	0.016
H6	Innovative knowledge → Strategic Intelligence	0.259	*5.540	0.000

Note * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

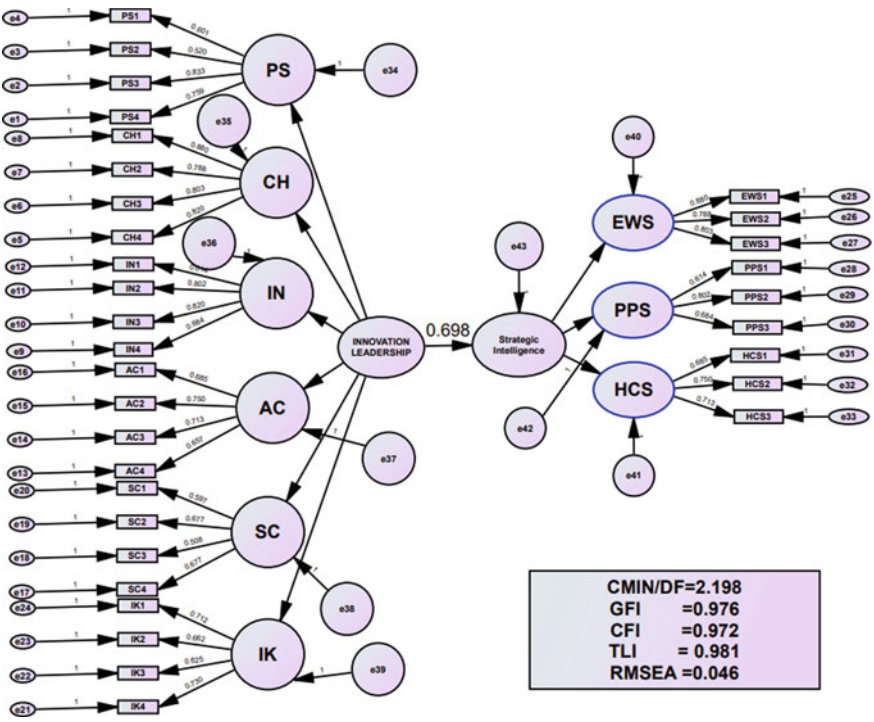

Fig. 2 SEM results of the digital marketing effect on mental image

and Ability to communicate (β = 0.093, $t = 1.557$, $p = 0.061$). However, the results indicated that the highest impact was for innovative knowledge (β = 0.259, $t = 5.540$, $p = 0.000$), followed by problems solving and decisions making (β = 0.214, $t = 5.335$, $p = 0.00$), and finally the lowest impact was for stimulating creativity (β = 0.124, $t = 2.446$, $p = 0.016$).

6 Discussion and Recommendations

Leadership in insurance companies in Jordan has features related to creative leadership with the ability to solve problems and make decisions, and what distinguishes it is also its active role in taking the initiative, and to achieve all the features, leadership needs knowledge because knowledge represents strength in the institution, and knowledge needs it all the operations that the company wants to accomplish, in addition, the communication system in the companies plays a major role in facilitating the delivery of knowledge that enhances the possibility of solving problems and making decisions, Leaders have the ability to anticipate problems that their institutions may

face before they occur, and despite the numerous obstacles to work in these institutions, they are able to focus on their work and complete their tasks, which motivates these leaders to seek out all new knowledge in their fields. To improve its ability to face future problems, which requires leaders of these companies to instill enthusiasm and courage in employees, allowing them to express themselves more freely, with follow-up to identify complaints that may arise from a lack of knowledge or a lack of coordination or integration between departments and units at the institutional level.

The findings show that the companies are concerned with the perception of the institution as a coherent and harmonious system, with a reliance on the study of ideas collectively rather than individually to feel their value in the long run, and the analysis of any problem by looking at its combined causes rather than separating its factors from each other, which aids in seeing the events that surround the institution more clearly, and enhances the companies effectiveness. This result is consistent with the study's findings. The results of the research proved that there is an impact of innovative leadership in enhancing strategic intelligence, that the presence of innovative knowledge is the basis for solutions to problems that companies have not previously dealt with. To do so, it is necessary to activate the communication system in institutions in order to achieve competitiveness among them, and then to move toward the application of ideas to bring about the necessary change, and these practices must be governed by a set of practices that enhance learning, where these practices must be reflected in learning processes to consolidate and devote it to serving the objectives. The findings of this theory are consistent with those of Jatheer, Al-Abadi, and Al-Qaisi and Qassem. The findings of the study also matched those of Al-Quwaz, who used the Asia Company in Iraq as a case study to validate the impact of strategic knowledge in boosting strategic intelligence.

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The Impact of Organizational Innovation Capabilities on Sustainable Performance: The Mediating Role of Organizational Commitment

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Abstract The major aim of the study was to examine the impact of organizational ambidexterity on sustainable performance in the presence of organizational commitment as a mediator. Therefore, it focused on Kuwaiti Industrial sector. Data were primarily gathered through self-reported questionnaires created by Google Forms which were distributed to a sample of (450) administrators via email. In total, (402)

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_78

responses were received including (10) invalid to statistical analysis due to uncompleted or inaccurate. Hence, the final sample contained (392) responses suitable to analysis requirements that were formed a response rate of (87.11%). structural equation modeling (SEM) was conducted to test hypotheses. The results showed that organizational commitment mediated the relationship between organizational capabilities and sustainable performance. Based on the research results the researchers recommend the oil sector to follow up the information related to the latest technological methods used in its sector, providing attention to setting the plans that aim at improving the human resources and train them to support exploration and exploitation skills.

Keywords Authentic leadership · Sustainable performance · Knowledge ability · Jordan customs department

1 Introduction

Sustainable performance concept is based on development concept (social and economic development in line with environmental constraints), needs concept (resources redistribution to ensure the life quality for all) and future generations' concept (the possibility of using resources in the long term to ensure the necessary quality of life for future generations). Where the essence of sustainable performance concept stems from the triple bottom line concept, which includes a balance between three pillars of sustainability, namely environmental sustainability, which focuses on maintaining the quality of the environment necessary to carry out economic activities and the quality of people's lives, and social sustainability, which strives to ensure human rights and equality, and preserve cultural identity., respect for cultural diversity, ethnicity and religion, and economic sustainability necessary to maintain the natural, social and human capital necessary for income and standards of living (AlTaweel & Al-Hawary, 2021; Al-Hawary & Al-Syasneh, 2020; Al-Hawary & Mohammed, 2017; Al-Hawary et al., 2012; Al-Hawary, 2009). Ambidexterity has become a popular concept for understanding certain aspects of organizational planning, and it plays an important role in competition because it supports organizational growth and enhances organizations' future vision for survival in addition to the challenges faced by organizations that have forced them to adopt organizational ambidexterity as an integral part of their strategy, as it is considered essential that be aware of these challenges in the local and global business environment (Al-Nady et al., 2013, 2016; Al-Hawary & Aldaihani, 2016; Allahow et al., 2018; Mohammad et al., 2020; Al-Hawary & Hadad, 2016; Al-Hawary & Obiadat, 2021; Alhalalmeh et al., 2020; Al-Hawary & Alhajri, 2020; Alshurideh et al., 2017; Alolayyan et al., 2018; Metabis & Al-Hawary, 2013). This highlights the human element role in achieving this and what it requires of the employee's stay in the organization in order to achieve the goals set

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and maintains the presence of the workforce committed to the organization in order to achieve a high level of organizational commitment (Al-Hawary & Alajmi, 2017; Al-Hawary & Nusair, 2017; Al-Hawary et al., 2020; Al-Lozi et al., 2017, 2018). This study is an objective attempt to shed light on the rapid development of modern administrative concepts, especially the organizational ambidexterity concept, which has become an effective management method and its role in promoting sustainable performance, as well as achieving the oil companies' goals through theoretical knowledge to achieve a clear understanding and define the concepts and objectives of the variables under discussion. Study importance also lies in applying the study to one of the most important economic sectors in Kuwait capital, which is the petroleum sector. The petroleum sector in the Kuwait capital is one of the most important economic sectors that contribute to the gross domestic production. As oil companies operate in a very dynamic and complex environment, and this is what prompted them to adapt to work in the administrative, economic, technological and societal fields, they are obliged to respond quickly to environmental changes, because the lack of a rapid response may lead to damage their work and their retreat from their competitors. Thus, these companies must effectively manage the changing business conditions, trying to retain their customers as well as attract new ones (Alshurideh, 2016, 2022; Alkitbi et al., 2020; Alsharari & Alshurideh, 2020), and this is what made the capabilities and skills that help them to succeed through achieving organizational ambidexterity of great importance to them. It is also necessary to ensure, through this study, a high level of organizational commitment that may contribute to enhancing sustainable performance in the Kuwaiti petroleum sector (Oyewobi et al., 2019).

2 Literature Review and Hypotheses Development

2.1 Organizational Ambidexterity

Organizational ambidexterity broadly refers to the organization's ability to pursue two different things at the same time, that is, the organization can exploit existing competencies in addition to exploring new opportunities with equal skill based on adapting to changing environmental conditions and obtaining a sustainable competitive advantage (Altamony et al., 2012; Obeidat et al., 2021; Shamout et al., 2022). It also depends on both exploiting existing resources and exploring new opportunities in order to make an innovation (Al Naqbi et al., 2020; Alameeri et al., 2021). The concept of ambidexterity is the ability to use both hands equally effectively. In the field of organizations ambidexterity is related to balancing the capabilities that exist in the organization and the way to use them, and at the same time searching for other possibilities, which are exploitation and exploration. Booth-Kewley et al. (2017) emphasize the same idea, noting that from a terminological perspective, the word "ambidextrous" means the ability to use both hands equally at the same time. Kafetz

opoulos (19,2020) defines organizational ambidexterity as the organization ability to implement and adopt incremental and revolutionary changes, while Du et al., (2020, 50) defined them as organizations that are able to exploit existing competencies as well as explore new opportunities. Gürlek (2021) defined organizational ambidexterity as the organization's ability to implement new changes in its environment in an orderly and correct manner. Organizational ambidexterity is also defined by Bresciani et al. (2018) as the organization ability to exploit existing competencies and explore new opportunities at the same time. For long-term survival, the organization needs to exploit existing capabilities and explore alternative opportunities (Martin et al., 2019). The ability to do both activities simultaneously is called organizational ambidexterity. It is the ability to combine contradictory, inconsistent and sometimes incompatible organizational elements such as exploratory and exploitative activities, strategies, structures, processes, mindsets, behaviors, etc. (Posch & Garaus, 2020). At the core of ambidexterity, there are two different activities–exploration and exploitation. The exploitation purpose is to improve and increase performance. While exploration goal, in turn, is to look for new opportunities and experiment. Both exploration and exploitation are necessary if the company aim to remain sustainable and to continue for the long term (Alshurideh et al., 2020; Alshurideh et al., 2022; Lee et al., 2022a, 2022b). But at the same time, many organizations struggle to strike a balance between exploration and exploitation, discovery and exploitation are the most important capabilities of organizational ambidexterity (López-Sánchez & Santos-Vijande, 2020).

2.2 Sustainable Performance

Sustainability is a broad term, as it draws on politics, economics, philosophy and other social sciences in addition to the natural sciences. Sustainability skills and environmental awareness are a priority in many organizations, as organizations seek to comply with new legislation related to urban planning, environmental consulting (the built and natural environment), and agriculture, not for profit. In addition to corporate strategies, health assessment and planning, and even in law and decision-making (Alzoubi et al., 2022; Ben-Abdallah et al., 2022; Ögmundarson et al., 2020). Rosenberg et al. (2021) indicates that sustainability practices support health, environmental, human and economic practices, where the sustainability principle assumes that resources are limited and must be used wisely, taking into account long-term priorities and the consequences of the ways in which resources are used.

Pislaru et al. (2019) defined sustainable performance as the competitiveness of an organization that ensures a sustainable presence in the marketplace and is able to reconcile all partners expectations, create value for shareholders and customers, and recognize the sustainable development importance. On the other hand, Huo

et al. (2019) viewed sustainable performance as the alignment of financial, environmental and social objectives in delivering an organization's core business activities in order to maximize value, including operational excellence, risk management, product innovation, growth, and governance to transform business performance and radically improve it and create stakeholders value. Among the types of sustainable performance on which previous studies focused.

Among the most prominent types of sustainable performance mentioned in previous studies, **Economic performance**: It is a practical and actionable toolkit that designs strategies to act on unexpected and unpredictable economic events (Al-Jarrah et al., 2012; Poltronieri et al., 2019), **Social performance** is the effective translation of organization's mission into practical reality in line with accepted social values related to improving the individuals lives in society and giving them the opportunity to work and develop. **Environmental Performance**: Ojo and Fauzi (2020) find that organizations' environmental performance helps individual governments assess progress in achieving their environmental goals; In addition to promoting continuous policy dialogue and peer learning; and stimulate greater governments accountability to each other and to public opinion.

2.3 Organizational Commitment

Organizational commitment takes an important role in employees' retention and turnover in organizations, and organizational commitment appears when employees are committed to their work in the organization and are motivated to achieve high performance levels (Al Kurdi et al., 2020; Alameeri et al., 2020; Al-Hawary & Alajmi, 2017; Kurdi et al., 2020). Karami et al. (2017) noted that workplace commitment can be divided into different aspects, where an employee may be committed to the job, profession, goals, teams, leaders, or organization, However, it is well recognized that employees develop more than one commitment related to work, and while all of these can be seen in the workplace and affect the overall employee commitment in the workplace, they all have their own characteristics. While Kaplan and Kaplan (2018) assure that just as commitment is difficult to comprehensively define, the same difficulty lies in organizational commitment, however, it has been possible to find common factors for different definitions, Alhalalmeh et al. (2020) define organizational commitment as the organization member psychological view towards his association with the organization in which he works, and organizational commitment plays a vital role in determining whether the employee will stay with the organization for a longer period of time and work enthusiastically towards achieving organizational goals. As for Imamoglu et al. (2019) viewed organizational commitment as the employee's relationship size with the organization and the extent of the strength of this relationship, and organizational commitment is related to many things, including the employee's belief in the organization's goals and values, and the employee's position in making effort for the organization and the desire to stay.

Novitasari et al. (2020) define organizational commitment as the employee's attachment to the organization based on the intention to remain in it; adherence to the organization values and goals; And the willingness to make an extra effort in its favor, that is, for individuals to look at the extent to which their values and goals are related to the organization values as part of the organizational commitment, so it is considered the link between the individual employee and the organization. Labrague et al. (2018) argue that the important theories of organizational commitment are a Three Component Model (TCM), and according to this theory, there are three distinct components of organizational commitment: Emotional commitment is the emotional attachment that an employee has to the organization, ongoing commitment which is the employee's belief that leaving the organization will be costly. The last dimension of the organizational commitment model is normative commitment, which is seen as the obligation sense to keep going because it is the right thing to do (AlShehhi et al., 2020; Alsuwaidi et al., 2020; Gopinath et al., 2020; Allozi et al., 2022).

2.4 Organizational Ambidexterity, Sustainable Performance and Organizational Commitment

Kraner (2018) indicates that there are many previous studies that proved that organizational ambidexterity has a significant impact on organizational excellence, where the researcher confirmed that organizational ambidexterity with its complete concept and capabilities can contribute significantly to increasing the organization growth despite the difficulty of achieving it on a practical level. As Backović and Djurić (2019) pointed out that the achieving organizational ambidexterity at the practical level lies in "balancing", finding and creating a balance between discovery and exploitation in an equal manner at the same time maintaining the highest possible performance level, while Campanella et al. (2020) agreed with the same opinion, pointing out that organizational ambidexterity appears to be a management term of some kind, but in reality there is a great conflict between the organizational ambidexterity abilities in terms of exploration and exploitation. Limaj and Bernroider (2019) argue that organizational ambidexterity has a positive effect on organizational excellence, where researchers found that ambidexterity had a positive impact on the organizations growth by creating an appropriate balance in the adaptation attempts in a turbulent environment, The previous literature–Felício et al. (2019) and Rialti et al. (2019) highlights some of achieving ambidexterity in organizations outcomes, where organizational ambidexterity can lead to better performance, better founders, long-term success and sustainable competitive advantage. Sustainability is now viewed as a key business imperative that leads to cost savings and value creation. While many organizations already have a sustainability strategy in place, there is a growing need to make this business more focused, in terms of operational excellence, risk management, and product innovation, growth, and governance (Almaazmi et al., 2020; Al

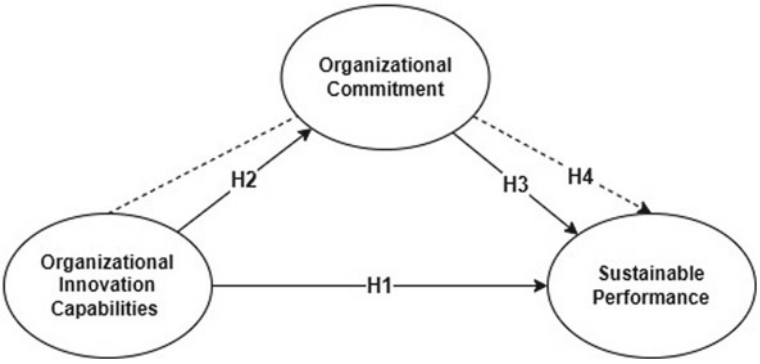

Fig. 1 Research model

Suwaidi et al., 2020; Belhadi et al., 2021). Rialti et al. (2019) study was found that organizational commitment has a positive and significant impact on economic performance, and organizational commitment has a positive and important impact on environmental performance, and a positive and significant impact on social performance, and organizational commitment has a positive and important impact on the company's performance in sustainability. Accordingly, the study hypothesis can be formulated as follows:

There is a significant impact of organizational ambidexterity on achieving sustainable performance in the presence of organizational commitment in oil companies in the capital of Kuwait.

3 Study Model

See (Fig. 1).

4 Methodology

4.1 Population and Sample Selection

A qualitative method based on a questionnaire was used in this study for data collection and sample selection. The major aim of the study was to examine the impact of organizational ambidexterity on sustainable performance in the presence of organizational commitment as a mediator. Therefore, it focused on Kuwaiti Industrial sector. Data were primarily gathered through self-reported questionnaires created

by Google Forms which were distributed to a sample of (450) administrators via email. In total, (402) responses were received including (10) invalid to statistical analysis due to uncompleted or inaccurate. Hence, the final sample contained (392) responses suitable to analysis requirements that were formed a response rate of (87.11%), where it proved to be sufficient to the extent that was predictable and allowed for a presumption of data saturation (Sekaran & Bougie, 2016).

4.2 Measurement Instrument

A self-reported questionnaire that consists of three main sections along with a section regarding control variables was used as the measurement instrument. Control variables considered as categorical measures were composed of gender, age group, educational level, and experience. The three main sections were dealt with a five-point Likert scale (from 1 = strongly disagree to 5 = strongly agree). The first section contained (15) items to measure organizational ambidexterity capabilities based on (López-Sánchez & Santos-Vijande, 2020). These items were distributed into dimensions as follows: five items dedicated for measuring acknowledgment, five items dedicated for measuring exploitation, and five items dedicated for measuring re-engineering. The second section related to organizational commitment variable which contained eight items developed according to (Al-Hawary & Alajmi, 2017). Whereas the third section included (15) items developed to measure sustainable performance according to what was pointed by (Ojo & Fauzi, 2020). This variable was a second-order construct divided into three first-order constructs. Economic performance measured by five items, environmental performance measured through five items, and social performance measured using five items.

5 Findings

5.1 Measurement Model Evaluation

This study was conducted structural equation modeling (SEM) to test hypotheses, which represents a contemporary statistical technique for testing and estimating the relationship between factors and variables (Wang & Rhemtulla, 2021). Accordingly, the reliability and validity of the constructs were tested using confirmatory factor analysis (CFA) through the statistical program AMOSv24. Table 1 summarizes the results of convergent and discriminant validity, as well the indicators of reliability.

Table 1 shows that the standard loading values for the individual items were within the domain (0.582–0.902), these values greater than the minimum retention of the elements based on their standard loads (Al-Lozi et al., 2018; Sung et al., 2019). Average variance extracted (AVE) is a summary indicator of the convergent validity

Table 1 Results of validity and reliability tests

Constructs	1	2	3	4	5	6	7
1. Acknowledgment	**0.747**						
2. Exploitation	0.312	**0.768**					
3. Re-Engineering	0.297	0.344	**0.748**				
4. Organizational Commitment	0.415	0.281	0.461	**0.760**			
5. Economic Performance	0.364	0.384	0.320	0.566	**0.761**		
6. Environmental Performance	0.481	0.465	0.405	0.502	0.468	**0.777**	
7. Social Performance	0.375	0.597	0.554	0.495	0.566	0.591	**0.742**
VIF	1.805	1.225	1.648	–	–	–	–
Loadings range	0.643–0.823	0.671–0.902	0.705–0.813	0.582–0.871	0.705–0.824	0.726–0.825	0.681–0.792
AVE	0.558	0.589	0.559	0.578	0.579	0.603	0.551
MSV	0.415	0.387	0.501	0.495	0.461	0.513	0.466
Internal consistency	0.860	0.875	0.861	0.913	0.870	0.883	0.857
Composite reliability	0.862	0.878	0.863	0.915	0.873	0.884	0.859

Note All correlations have a significance level less than 0.05, bold fonts refer to the square root of AVE

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of constructs that must be above 0.50 (Howard, 2018). The results indicate that the AVE values were greater than 0.50 for all constructs, thus the used measurement model has an appropriate convergent validity. Rimkeviciene et al. (2017) suggested the comparison approach as a way to deal with discriminant validity assessment in covariance-based SEM. This approach is based on comparing the values of maximum shared variance (MSV) with the values of AVE, as well as comparing the values of square root of AVE ($\sqrt{}$AVE) with the correlation between the rest of the structures. The results show that the values of MSV were smaller than the values of AVE, and that the values of $\sqrt{}$AVE were higher than the correlation values among the rest of the constructs. Therefore, the measurement model used is characterized by discriminative validity. The internal consistency measured through Cronbach's Alpha coefficient (α) and compound reliability by McDonald's Omega coefficient (ω) was conducted as indicators to evaluate measurement model. The results listed in Table 1 demonstrated that both values of Cronbach's Alpha coefficient and McDonald's Omega coefficient were greater than 0.70, which is the lowest limit for judging on measurement reliability (de Leeuw et al., 2019).

5.2 *Structural Model*

The structural model illustrated no multicollinearity issue among predictor constructs because variance inflation factor (VIF) values are below the threshold of 5, as shown in Table 1 (Hair et al., 2017). This result is supported by the values of model fit indices shown in Fig. 1. (Fig. 2)

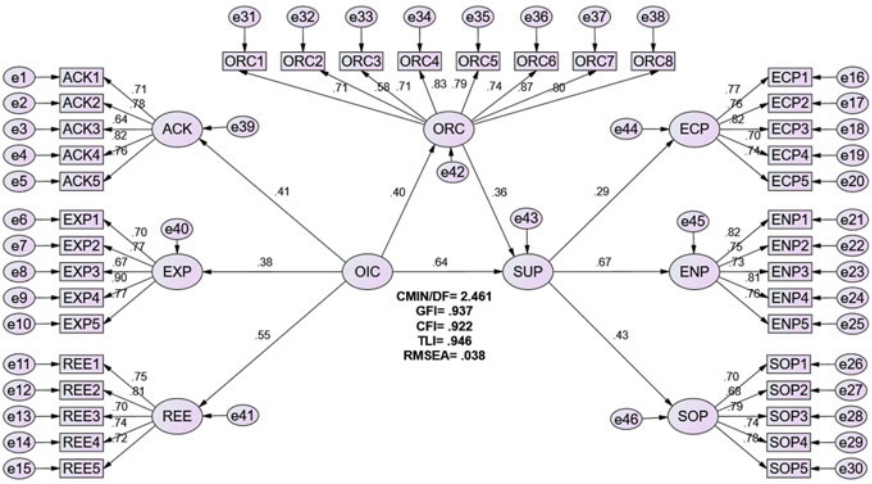

Fig. 2 SEM results of the organizational innovation capabilities effect on sustainable performance through organizational commitment

Table 2 Hypothesis testing

Relation	Direct effect		Indirect effect		Total effect		
	β	*p* value	β	*p* value	β	*t* value	*p* value
OIC → SUP	0.642***	0.000			0.642***	18.609	0.000
OIC → ORC	0.403**	0.002			0.403**	16.224	0.002
ORC → SUP	0.364***	0.000			0.364***	12.166	0.000
OIC → ORC → SUP	0.642***	0.000	0.147*	0.02	0.789*	21.547	0.02

Note OIC: Organizational Innovation Capabilities, SUP: Sustainable Performance, ORC: Organizational Commitment, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

The results in Fig. 1 indicated that the chi-square to degrees of freedom (CMIN/DF) was 2.461, which is less than 3 the upper limit of this indicator. The values of the goodness of fit index (GFI), the comparative fit index (CFI), and the Tucker-Lewis index (TLI) were upper than the minimum accepted threshold of 0.90. Moreover, the result of root mean square error of approximation (RMSEA) indicated to value 0.038, this value is a reasonable error of approximation because it is less than the higher limit of 0.08. Consequently, the structural model used in this study was recognized as a fit model for predicting the sustainable performance and generalization of its result (Ahmad et al., 2016; Shi et al., 2019). To verify the results of testing the study hypotheses, structural equation modeling (SEM) was used, the results of which are listed in Table 2.

The results demonstrated in Table 2 show that organizational ambidexterity have a positive direct effect on sustainable performance ($\beta = 0.642$, $t = 18.609$, $p = 0.000$) and organizational commitment($\beta = 0.403$, $t = 16.224$, $p = 0.002$). Organizational commitment has also positive direct effect on sustainable performance ($\beta = 0.364$, $t = 12.166$, $p = 0.000$). Furthermore, organizational commitment mediated the relationship between organizational capabilities and sustainable performance with total effect ($\beta = 0.789$, $t = 21.547$, $p = 0.02$) and indirect effect ($\beta = 0.147$, $p = 0.02$).

6 Discussion

The study results showed an impact of organizational ambidexterity on sustainable performance through organizational commitment, study results showed that the organizational ambidexterity strategy application achieves cost-effectiveness and helps organizations meet different customer's needs. In addition, organizational ambidexterity is critical to organizational survival and success. Also, reaching a state of organizational excellence requires providing constructive feedback, not negative criticism, and employees must be provided with constructive comments whenever needed, study results showed that organizational commitment can lead to a stable and productive workforce and help employees to increase their creativity and contribute to organizational development initiatives. Also, highly committed employees do not leave

the organization because they are dissatisfied and tend to undertake difficult work activities, as committed members are usually achievers and innovative mentors with the ultimate goal of participating and improving performance. When an employee commits to an organization, many positive outcomes can be seen for the individual as well as for the organization itself. One of the advantages that it can affect the customer's well-being, additionally, increases employee's job satisfaction increases commitment. An organization can benefit from committed employees in a variety of ways, at scale, in terms of increasing their ability to influence the organization's effectiveness, employees are also less likely to leave the organization, which reduces employee turnover. Equally important, committed employees can often make things work even without good systems, and they are key to increased productivity in organizations. This result agrees with Muhammad, which confirmed the existence of a significant correlation between organizational ambidexterity and sustainable performance, it also agrees with the study of Hijjawi and Mohammad, which confirmed that organizational ambidexterity had a significant effect on organizational conflict.

7 Recommendations

Based on the research results the researchers recommend the oil sector to follow up the information related to the latest technological methods used in its sector, providing attention to setting the plans that aim at improving the human resources and train them to support exploration and exploitation skills Support the organizational culture the promote organizational commitment. Reducing the amount of wastage that cause harm to the environment to the least possible level, reducing the risks associated with work to the least possible level.

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Authentic Leadership and Its Impact on Sustainable Performance: The Mediating Role of Knowledge Ability in Jordan Customs Department

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Abstract The study aimed to identify the impact of authentic leadership on sustainable performance through knowledge Ability from the point of view of employees in Jordan customs department. The study population consisted of all 678 employees in the border centers of the Jordan Customs Service, where a random sample was taken proportional represented by the study population by 271 individuals, and the study

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_79

used the statistical package for social sciences (SPSS), in addition to using the Amos program. The study concluded that there is a statistically significant effect of authentic leadership in sustainable performance through knowledge Ability from the point of view of employees in border centers in the Jordan Customs Department. The study recommended a set of recommendations and suggestions that contribute to maintaining the sustainability of performance and enhancing growth and development in the Jordanian Customs Department.

Keywords Authentic leadership · Sustainable performance · Knowledge ability · Customs department · Jordan

1 Introduction

Leadership plays an important role in the individuals, societies and organizations level, as history has witnessed over the past ages nations and societies that have risen and developed thanks to their great leaders, and many organizations have achieved success and development at the global level through their leaders work, and on the contrary, leaders have been a cause of organizations failure and extinction (Alameeri et al., 2020; Al-Hawary, 2009; Al-Hawary et al., 2012, 2013; Metabis & Al-Hawary, 2013). On the other hand, recent years have witnessed many conferences dealing with ethics especially in work ethics, most of which centered on the necessity of creating a global ethical charter and limiting scandals and violations in the business field (Al-Hawary, 2015; Al-Hawary & Abu-Laimon, 2013; Al-Lozi et al., 2017; AlShehhi et al., 2020; Alyammahi et al., 2020). Organizations leadership style is the basis of organizations work, as it is mainly responsible for their progress or decline in front of competing organizations, as the issue of leadership is considered one of the most important topics in management science (Al-Dhuhouri et al., 2020; Odeh et al., 2021). Authentic leadership theory clarifies the behaviors that leaders must exhibit as well as addressing the absence of the most important of these behaviors that leaders may lack, and as a reaction to the business environment that is characterized by technological developments and changes and intense competition; Organizations have found new ways to counter these developments, Organizations must pay attention to the employees positive state and their sense of vitality and optimism towards achieving personal and organizational goals, which is better and positively reflected on the organizations overall performance continuity and sustainability (Alhalalmeh et al., 2020; Al-Hawary & Alajmi, 2017; Al-Hawary & Al-Namlan, 2018; Al-Hawary & Hadad, 2016; Al-Hawary & Obiadat, 2021; Al-Hawary et al., 2020; Al-Nady et al., 2013; Harahsheh et al., 2021; Mohammad et al., 2020). The authentic leadership style has emerged recently, in which leaders apply the principles and values of honesty, transparency and ethical standards. The term sustainable performance has emerged

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as a modern management concept concerned with society and the environment as basic pillars for achieving sustainable growth and development. It is not limited to achieving financial and economic performance only, but also integrates all social and environmental conditions within the organization's strategic plan (Al- Quran et al., 2020). As well as the term knowledge competence, which requires more time and work to understand and clarify, as it represents all the capabilities that contribute to building a pioneering knowledge organization capable of keeping pace with all developments in the surrounding environment, and providing the best services with the least time and effort, through the optimal use of modern technology and workers attention and motivating towards creativity and excellence (Allahow et al., 2018; Al-Hawary & Al-Syasneh, 2020; AlTaweel & Al-Hawary, 2021; Al-Hawary & Alwan, 2016; Al-Hawary & Aldaihani, 2016).

Study importance stems from the importance of the effect achieved by authentic leadership on sustainable performance through the knowledge ability in the Jordan Customs Department. Where this study linked between modern variables and dealt with modern sub-dimensions of those variables which are of great importance in organizations growth and development study problem is the Jordanian Customs Department sustainable performance and how to maintain this performance in light of the surrounding environmental changes, through authentic leadership, and with the emergence of contemporary global challenges and the spread of the global epidemic of covid-19, All this led to a decline in revenues and customs collections, due to border closures and global closures of trade outlets, here, authentic leadership appeared to be the best solution in overcoming these difficulties and transforming challenges into opportunities (Almazrouei et al., 2020; Allozi et al., 2022). However, the problem lies in the existence of different standards in the Customs Department regarding the extent of plans implementation, either due to negligence or shortcomings in legislation or changes in regulations and laws that affect the implementation process (Al Kurdi et al., 2021; Alshurideh, 2022). While this gap remains, the performance outputs and the quality of provided services are affected, and this gap may lead to a decrease in revenues levels, and this was evident during the year (2020), where revenues decreased from the year (2019) by (39) million dinars, and the department also witnessed a decrease in the customs data registered numbers as in 2019 (819) thousand customs declarations, In 2020, it amounted to (699) thousand statements.

This study came to clarify the relationship between authentic leadership as a modern leadership style and sustainable performance, which ensures the organization permanence and survival. This study attempts to provide a qualitative addition to knowledge that helps decision makers to identify this modern leadership style, which helps in making change decisions and facing challenges. The study focused on authentic leadership in terms of concept, application requirements, and advantages achieved by organizations in which there is authentic leadership, and also dealt with the relationship and role of authentic leadership in maintaining the performance sustainability and continuity. Also, many studies focused on the authentic leadership concept, its components, its importance and its relationship to the organizational, market and economic performance of business organizations. This study comes to shed light on the components of authentic leadership in the Jordanian

Customs Department, and this study contributes to measuring the extent of authentic leadership influence the Jordanian Customs Department overall performance.

2 Literature Review and Hypotheses Development

2.1 Authentic Leadership

Organizations dominant leadership style is the main focus of their work, as it is responsible for their progress or decline extent with competing organizations (Al-Hawary & Nusair, 2017)**.** The issue of leadership is considered one of the most important topics in management science, and perhaps clarifying the most important behaviors that leaders must have was the share of the original leadership theory, as well as addressing the absence of the most important of these behaviors that leaders may lack, As organizations are operating in a business environment characterized by technological developments and changes, and intense competition; Therefore, it is necessary to adopt new methods to confront these developments, especially the crises that the world has faced as a result of the Corona pandemic and the subsequent economic crises, and the breakdown of organizations (Alshurideh et al., 2021; Pendleton and Jonathan 2021, 18).

Authentic leadership includes, at its roots, all positive qualities, such as self-confidence, integrity, and credibility, and seeks to achieve the goal in order to achieve psychological and social well-being, through the application of positive features of leadership, based on authentic leader values, believes, and the consistent behaviors (Muhammed & Zaim, 2020, 14–15). Authentic leadership focuses on building followers' strengths, developing their capabilities, expanding their thinking, and creating a positive organizational context. The authenticity approach indicates that it is linked to followers' attitudes and behaviors and that the most important effects of authentic leadership are those whose results are due to the working and subordinate individual's behavior and actions. The authentic leadership effect arises through the individual sense of social affiliation between the leader and the follower (Chalon, 2018, 36). In light of this, studies and research have clarified multiple definitions of authentic leadership. Studies have shown that the authentic leadership essence is the availability of frankness, integrity and transparency, and positive psychological capabilities, such as (trust, hope and optimism), high moral behaviors and trust between the leaders and subordinates.

Studies also emphasized that authentic leadership focuses on positive behaviors that include enhancing self-confidence, sincerity, credibility, merit, and high moral values that are reflected in improving the relationship between the leader and his subordinates (Linda & Chester, 2013). Nair and Shrekumar (2021) believes that authentic leadership is formed as a result of the stimulating events that the individual goes through, during the various stages of his life, which generates experiences and capabilities in facing circumstances, and these experiences formed lead to the

positive psychological capabilities development (e.g., hope, optimism and confidence). Which leads to the development of self-awareness within the individual, and positive self-development leads to authentic leadership formation with a high degree of self-awareness and the ability to express values and behaviors with full force and determination. Authentic leadership is also defined as a leader's behavior pattern based on promoting positive self-development, a transparent and ethical leadership behavior that encourages openness in sharing information necessary for decision-making while accepting subordinates' views (Sparks, 2021, 55).

Self-awareness is one of the most essential aspects of authentic leadership, because it includes special knowledge of authentic leader values, beliefs, motives and experiences, and it refers to the successful leader behavior according to his motives and desires, as it helps the leader to control his emotions and deal based on value, Self-awareness represents a guarantee that the leader will take full responsibility for his behavior and his work, as it is not a point he reach, but rather it is an ongoing process. As for the Balanced Processing, it refers to the leader collecting the data and information necessary to make decisions, analyzing them accurately and objectively, extracting the results and discussing them before making the decision. With regard to the Internalized Moral Perspective, it means that managers possess and demonstrate internal moral standards and values rather than recognizing external pressures, however, originality reflects managers' ability to achieve harmony with themselves and their followers broadly, to achieve cooperation within and outside the organization.

Therefore, managers' values should be consistent with those generally accepted in the environment (e.g. society, organization) (Alshurideh et al., 2017, 2019). Individuals who have high levels of self-regulation manage their behavior to conform to ethical standards, which, on the one hand, represent the consistency of managers' behavior with their own values, and on the other hand, the managers' behavior consistency with the ethical rules that prevail within society and the organization (Alshurideh et al., 2017). And finally, relations transparency, that through transparency, ideas and beliefs are exchanged between the leader and the followers, as it works to present the authentic personality to others, and thus more confidence and reduce inappropriate emotions, which contributes to reducing organizational conflict intensity. Transparency in relationships also includes revealing the leader's authentic inner self and not the illusion or artificial personality. By showing the true self, the leader can gain the subordinates confidence and enhance their organizational commitment. And this also includes exchanging information and ideas with credibility and clarity (Al-Mansi, 2019).

2.2 Sustainable Performance

Organizations and companies seek to develop their competencies and resources, by noting the discrepancy in talents, aspirations and performance levels, and seek to build programs and policies to improve and raise organizations performance levels

and encourage the transfer of knowledge and expertise within the work environment, as this requires the leaders with experience, knowledge and ability to face difficulties (Chalon, 2018, 15)**.** Organizations looking for sustainability have goals that go beyond traditional concepts. The emergence of sustainable development concept has forced organizations to integrate the sustainable development dimensions and making sustainability a part of the organization's strategy, and this requires radical changes in the organization's performance. Sustainable performance is real performance and gives indications that the organization is moving in the right direction because it is a continuous and it can be expected in the future (Majid, 2020). Hence, sustainable performance is a combination of economic, social and environmental performance as it extends beyond the organization boundaries, and does not only address financial results, but extends to include taking into account working individuals' interests, the surrounding community and the natural environment (AlTaweel & Al-Hawary, 2021).

Ziemak and Katarzyna (2020) defines sustainable performance as the process of interaction between the organization work, the environment and society requirements, and profitability levels, and includes the extent to which the organization has succeeded in translating its goals into practical reality to maintain sustainability and continuity, to achieve more positives and reduce negatives, taking into account satisfying customers and employees and maintaining workplace safety. Rasool et al. refers to sustainable performance as the process of coordinating financial, environmental and social goals in order to maximize value, and it is based on four pillars that include achieving goals, use of resources, internal processes, and stakeholders.

Sustainable performance importance is based on the great responsibility that falls on organizations shoulders in the global economy, so performance sustainability has become a must, as it achieves a state of integration between the decisions taken daily by the organizations in order to facilitate business and enters the organizations in a new phase represented by how to transform into entities that serve the environmental, social and economic interests while preserving the stakeholders at the same time (Al-Mansi, 2019; Shamout et al., 2022).

2.3 Knowledge Ability

Al-Mansi (2019) indicated that knowledge ability represents the individual's ability to have a great knowledge of their working conditions and understand the procedures and rules they follow, that enable them to act in the appropriate way away from traditional organizational structures, and they have the ability to make better changes and use cognitive thinking to analyze problems and develop appropriate solutions (Al-Hawary & Al-Namlan, 2018; Al-Maroof et al., 2021; Al Mehrez et al., 2020). This means that they have an integrated cognitive knowledge that generates for them the ability to achieve high performance. Knowledge ability includes all cognitive capabilities and modern institutional methods that keep pace with development in order to be able to process the business content and tasks assigned to them; Cognitive

competence is one of the modern concepts that has attracted the researchers' attention and has become the most prominent guarantee for the future building requirements by focusing on the sustainable work efficiency and the employing the mental energies of working individuals efficiency (Agha et al., 2021; Al-Mawla & Harbi, 2019).

Knowledge ability importance is represented by what was stated by some writers and researchers. It has been pointed out that knowledge ability is linked to knowledge and experience, it absorbs its components and benefit from its potential and leads to policies and practice development and the means and strategies adoption, and it is capable of overcoming all obstacles and difficulties that prevent the goals achievement. To catch up with progress requires scientific and knowledge capabilities that give the organization and society the reasons for solid strength, and it also promotes working individuals to higher positions in their specialization field, and they are those who have the ability to assume responsibility and build ideas that serve the production or service process and have a spirit of responsibility (Al Suwaidi et al., 2020; Al-Mawla & Harbi, 2019).

The researchers tried directly or indirectly to describe the knowledge ability through a set of dimensions that came after the processes of analysis and interpretation of all its related aspects, the purpose of accurately defining knowledge ability dimensions is that it represents a great importance to the organization and reflects a distinguished level of human competencies, personal excellence, and commitment to moral guidance. As defined by the researchers, knowledge ability dimensions are as follows: Information Technology which is defined as a set of software, hardware, communications, database management and various data processing technologies that are used in computer-based information systems (Ibarra, 2015). Creative thinking which represents the ability to organize ideas in a different way, in order to invent new things, and includes restructuring knowledge to form a new vision (Proctor, 2021, 8).

2.4 Authentic Leadership, Sustainable Performance and Knowledge Ability

By reviewing books and studies on authentic leadership, the researcher concluded that it is based on the leader individual capabilities, where decisions are made based on clear and accurate information and with the others participation. It enhances trust between the leader and subordinates, which is reflected in the organization overall performance. Authentic leadership is closely related to the organization internal quality (organizational culture and organizational climate), and it is linked to job satisfaction, and this ultimately leads to raising the productivity levels, The researchers found that whenever there was an improvement in the level of job satisfaction by 5%, there was an increase of 1.2% in customer satisfaction, which led to an increase in the performance level by 0.5%, leadership influence was clear

in employees performance, which increases the productivity levels (Pendleton and Jonathan 2021).

Locared refers to authentic leadership as working to build the general welfare of humanity and achieve society interest, and defines an authentic leader as that individual who is fully aware of how to think and how to act, and is seen by others as aware of his own values and the values of others, and by integrating positive qualities such as hope and optimism, he motivates the followers to perform well and identify the individuals needs and desires in order to meet them and ensure the achievement of organization general objectives. Knowledge ability is an important resource for organization creativity and innovation processes, through the acquisition of external knowledge and the maximization of internal knowledge in order to raise the organization's ability to achieve competitive advantage (Duan et al., 2020). The term knowledge ability is one of the modern terms that requires more time and work to understand it, as it represents the possibility that works to re-characterize the organization from a traditional organization to a knowledge organization, so that it turns into a pioneering organization that has a high ability to face challenges through modern technological knowledge. In this way, knowledge ability can transform the organization through the type, activity or theories used, and then transform it into a knowledge organization. It represents the characteristic that responsible individuals carry outside the traditional role, as they have knowledge ability, technological skills and institutional methods that make them capable of knowing and treating their business content (Majid, 2020). Based on the above, study hypothesis can be formulated as follows:

There is no statistically significant impact of authentic leadership on sustainable performance with the presence of knowledge ability as a mediating variable in the Jordan Customs Department.

3 Study Model

See (Fig. 1).

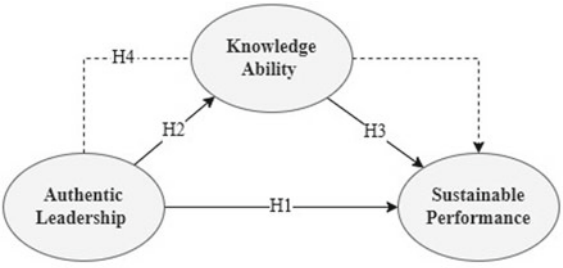

Fig. 1 Research model

4 Methodology

4.1 Population and Sample Selection

A qualitative method based on a questionnaire was used in this study for data collection and sample selection. The major aim of the study was to examine the impact of authentic leadership on sustainable performance through the mediating role of knowledge ability. Therefore, it focused on Jordanian customs centers. Data were primarily gathered through self-reported questionnaires creating by Google Forms which were distributed to a random sample of (320) employees via email. In total, (283) responses were received including (12) invalid to statistical analysis due to uncompleted or inaccurate. Hence, the final sample contained (270) responses suitable to analysis requirements that were formed a response rate of (84.68%), where it proved to be sufficient to the extent that was predictable and allowed for a presumption of data saturation (Sekaran & Bougie, 2016).

4.2 Measurement Instrument

A self-reported questionnaire that consists of three main sections along with a section regarding control variables was used as the measurement instrument. Control variables considered as categorical measures were composed of gender, age group, educational level, and experience. The three main sections were dealt with a five-point Likert scale (from 1 = strongly disagree to 5 = strongly agree). The first section contained (16) items to measure authentic leadership based on. These items were distributed into dimensions as follows: four items dedicated for measuring self-awareness, four items dedicated for measuring balanced processing, four items dedicated for measuring internalized moral perspective, and four items dedicated for measuring relational transparency. The second section related to knowledge ability variable which contained nine items developed according to (Al-Hawary & Alwan, 2016). These items distributed into two first-order constructs: five items for information technology and four items for creative thinking. Whereas the third section included (15) items developed to measure sustainable performance according to what was pointed by Afum et al. and Kamble et al. This variable was a second-order construct divided into three first-order constructs. Economic performance measured by five items, environmental performance measured through five items, and social performance measured using five items.

5 Findings

5.1 Measurement Model Evaluation

This study was conducted structural equation modeling (SEM) to test hypotheses, which represents a contemporary statistical technique for testing and estimating the relationship between factors and variables (Wang & Rhemtulla, 2021; Al-Adamat et al., 2020; Al-Gasawneh & Al-Adamat, 2020). Accordingly, the reliability and validity of the constructs were tested using confirmatory factor analysis (CFA) through the statistical program AMOSv24. Table 1 summarizes the results of convergent and discriminant validity, as well the indicators of reliability.

Table 1 shows that the standard loading values for the individual items were within the domain (0.627–0.902), these values greater than the minimum retention of the elements based on their standard loads (Al-Lozi et al., 2018; Sung et al., 2019). Average variance extracted (AVE) is a summary indicator of the convergent validity of constructs that must be above 0.50 (Howard, 2018). The results indicate that the AVE values were greater than 0.50 for all constructs, thus the used measurement model has an appropriate convergent validity. Rimkeviciene et al. (2017) suggested the comparison approach as a way to deal with discriminant validity assessment in covariance-based SEM. This approach is based on comparing the values of maximum shared variance (MSV) with the values of AVE, as well as comparing the values of square root of AVE ($\sqrt{}$AVE) with the correlation between the rest of the structures. The results show that the values of MSV were smaller than the values of AVE, and that the values of $\sqrt{}$AVE were higher than the correlation values among the rest of the constructs. Therefore, the measurement model used is characterized by discriminative validity. The internal consistency measured through Cronbach's Alpha coefficient (α) and compound reliability by McDonald's Omega coefficient (ω) was conducted as indicators to evaluate measurement model. The results listed in Table 1 demonstrated that both values of Cronbach's Alpha coefficient and McDonald's Omega coefficient were greater than 0.70, which is the lowest limit for judging on measurement reliability (De Leeuw et al., 2019).

5.2 Structural Model

The structural model illustrated no multicollinearity issue among predictor constructs because variance inflation factor (VIF) values are below the threshold of 5, as shown in Table 1 (Hair et al., 2017). This result is supported by the values of model fit indices shown in Fig. 1 (Fig. 2).

The results in Fig. 1 indicated that the chi-square to degrees of freedom (CMIN/DF) was 2.348, which is less than 3 the upper limit of this indicator. The values of the goodness of fit index (GFI), the comparative fit index (CFI), and the Tucker-Lewis index (TLI) were upper than the minimum accepted threshold of 0.90.

Table 1 Results of validity and reliability tests

Constructs	1	2	3	4	5	6	7	8	9
1. SAW	**0.786**								
2. BPR	0.347	**0.755**							
3. IMP	0.471	0.297	**0.774**						
4. RTR	0.445	0.364	0.415	**0.756**					
5. ITE	0.534	0.428	0.547	0.581	**0.744**				
6. CTH	0.394	0.497	0.552	0.496	0.418	**0.766**			
7. ECP	0.405	0.537	0.374	0.335	0.532	0.614	**0.759**		
8. ENP	0.534	0.637	0.622	0.579	0.674	0.597	0.574	**0.765**	
9. SOP	0.614	0.569	0.637	0.510	0.458	0.602	0.614	0.574	**0.781**
VIF	3.458	2.664	1.858	1.374	–	–	–	–	–
Loadings range	0.644–0.854	0.694–0.883	0.716–0.839	0.627–0.894	0.681–0.854	0.653–0.902	0.661–0.881	0.645–0.837	0.691–0.854
AVE	0.618	0.570	0.599	0.572	0.554	0.586	0.577	0.585	0.610
MSV	0.501	0.415	0.508	0.467	0.513	0.406	0.515	0.497	0.522
Internal consistency	0.862	0.837	0.855	0.839	0.857	0.846	0.869	0.873	0.882
Composite reliability	0.865	0.840	0.856	0.841	0.861	0.848	0.871	0.875	0.886

Note SAW: self-awareness, BPR: balanced processing, IMP: internalized moral perspective, RTR: relational transparency, ITE: information technology, CTH: creative thinking, ECP: economic performance, ENP: environmental performance, SOP: social performance

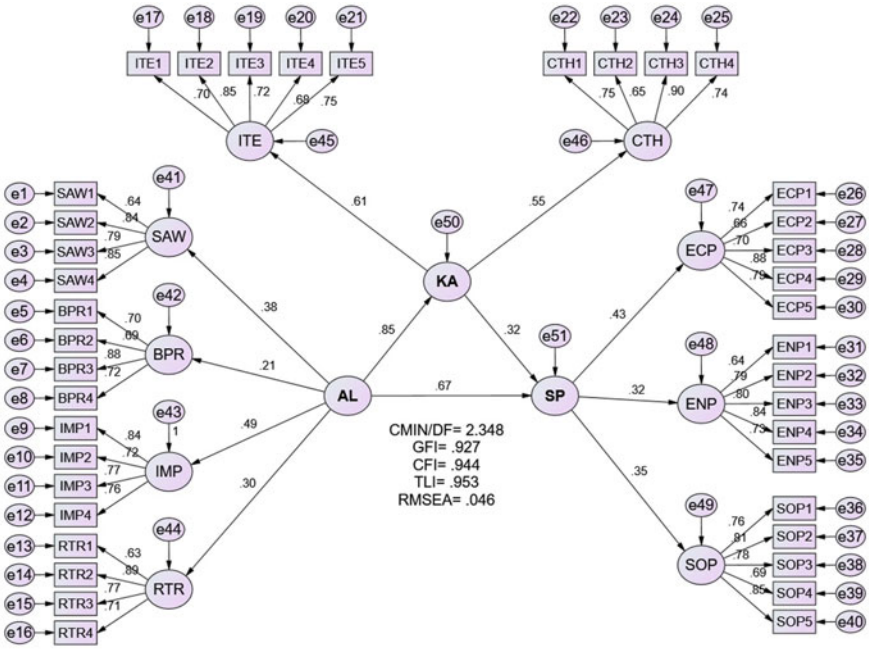

Fig. 2 SEM results of the ALimpact on SP through KA

Moreover, the result of root mean square error of approximation (RMSEA) indicated to value 0.046, this value is a reasonable error of approximation because it is less than the higher limit of 0.08. Consequently, the structural model used in this study was recognized as a fit model for predicting the sustainable performance and generalization of its result (Ahmad et al., 2016; Shi et al., 2019). To verify the results of testing the study hypotheses, structural equation modeling (SEM) was used, the results of which are listed in Table 2.

Table 2 Hypothesis testing

Relation	Direct		Indirect		Total		
	β	p-value	β	p-value	β	t-value	p-value
Authentic Leadership → Sustainable Performance	0.672	0.000			0.672	19.367	0.000
Authentic Leadership → Knowledge Ability	0.848	0.001			0.848	21.228	0.001
Knowledge Ability → Sustainable Performance	0.325	0.03			0.325	16.015	0.03
Authentic Leadership → Knowledge Ability → Sustainable Performance	0.672	0.000	0.275	0.000	0.947	28.641	0.000

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The results demonstrated in Table 2 show that authentic leadership has a positive direct impact on sustainable performance ($\beta = 0.672$, $t = 19.367$, $p = 0.000$) and knowledge ability ($\beta = 0.848$, $t = 21.228$, $p = 0.001$). Moreover, it indicated that knowledge ability has a positive impact on sustainable performance ($\beta = 0.325$, $t = 16.015$, $p = 0.03$). Hence, knowledge ability has a partial mediation effect in the relationship between authentic leadership and sustainable performance, where the total effect was ($\beta = 0.947$, $t = 28.641$, $p = 0.000$) with indirect effect of ($\beta = 0.275$, $p = 0.000$).

6 Discussion

Study results indicated that there is a statistically significant impact of the authentic leadership on sustainable performance in the presence of knowledge ability, and this explains the Customs Department interests in developing leaders that contribute to growth and development and have a future vision that keeps pace with developments in addition to modernization in individuals and equipment that contribute to raising the performance levels and achieving high growth indicators. Study results showed that the mediating role played by knowledge ability between authentic leadership and sustainable performance achieves positive results, and this is an indicator that confirms that the three main variables achieve a strong correlation, in that the Customs Department works to implement the authentic leadership style and maintains performance sustainability through it. Companies and individuals dealing with the Jordanian Customs Department need facilitated services and facilities to protect investment and the national economy, facilitate trade movement, achieve the highest quality levels in providing services and facilities, and ensure goods smooth arrival.

The results showed that the study variables dimensions represented in authentic leadership, sustainable performance and knowledge ability, reached high levels of application, which indicates the awareness extent of the Customs Department of these modern managerial concepts importance, and their role in achieving performance sustainability and growth in light of the surrounding changes and difficulties that the economy suffers from world and the international trade system. Study results showed the strategic role played by the Customs Department in supplying the state treasury with revenues through the high level of economic performance. This result is consistent with the study (Balogun et al., 2020), which showed that there is a significant and clear impact of authentic leadership on the performance level.

7 Recommendations

According to the study results and conclusions, the researcher presents a set of suggestions and recommendations, which in turn can benefit the researched organization, through the study results, it is clear that it has become necessary for the

Customs Department to promote the environmental sustainability concept and to practice activities and policies that are reflected on the surrounding environment by preventing pollution, preventing the entry of products harmful to the environment and society, and promoting a culture of green environment among employees. The Customs Department is considered one of the institutions based on knowledge and technology. Therefore, the Customs Department must develop strategies based on knowledge transfer process and ease of access and conduct more knowledge transfer courses and enhance the growth and self-development levels. The study recommends also for increasing the space of participation in decision-making by listening to different viewpoints, and this is done through holding meetings and seminars that contribute to the views transfer on the performance level and strengths and weaknesses in order to overcome problems and find solutions to all customs work obstacles. Through the study results, which reflected the development and growth level reached by the Customs Department, the researcher recommends increasing the participants numbers in foreign courses to learn about global customs experiences in order to gain more experience and knowledge, as the participants number in foreign courses is few in light of the surrounding environment developments and the global competition increase.

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The Impact of Innovative Leadership on Crisis Management Strategies in Public Institutions in the State of Qatar

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Abstract The study aimed to examine the impact of innovative leadership practices on crisis management strategies in public institutions in the State of Qatar. The study population consisted of public institutions in the State of Qatar. In order to achieve the objectives of the study, a questionnaire was developed to collect data from the analytical unit, the Social Statistical Sciences Package (SPSS V.25) was adopted. The

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_80

AMOS V.25 program were adopted for path analysis. The study showed an impact of Innovative leadership on crisis management strategies. The study recommended the need for Qatari public institutions to focus on creating strong relationships with strategic partners in the internal Qatari environment and the external environment.

Keywords Innovative leadership · Crisis management strategies · Public institutions · Qatar state

1 Introduction

The communications and information technology revolution has contributed to the scientific, cultural and technological developments that are unprecedented in human history, which made institutions of all kinds and orientations seek to keep pace with these developments, and review their policies, objectives, technologies and activities related to creativity, change and continuous improvement of their services and products (Al-Lozi et al., 2017; Al-Hawary & Al-Syasneh, 2020; Al-Quran et al., 2020; AlTaweel & Al-Hawary, 2021; Al-Hawary & Obiadat, 2021).

Organizations must prepare leaders and provide them with the skills that enable them to carry out the tasks entrusted to them to the fullest and to achieve the goals and objectives of the organization (Al-Hawary et al., 2012; Al-Hawary & Al-Hamwan, 2017; Al-Hawary & Mohammed, 2017; Al-Hawary, 2009; Mohammad et al., 2020). It is evident from monitoring the developments that occurred in the developed countries that the institutions were able to overcome all the obstacles they were facing by encouraging creative practices and applying them on the ground and updating the different methods of work that was a reason for the superiority and progress of countries, provided that these methods and tools are adapted to suit Arab environments (Al Kurdi et al., 2020; AlShehhi et al., 2020; Odeh et al., 2021; Alshurideh, 2022).

Since the crisis has a renewed and developed character, it needs the presence of creative leaders to deal with it by formulating a vision, a message and strategic goals to deal with crises as they occur, as most of the crises are considered emergency and sudden events that often have no introduction, and therefore the matter requires the presence of creative leaders able to take decisive decisions at the appropriate times and seize the initiative in leading, influencing and directing events as appropriate. The Ambidexterity of leadership lies in envisioning the possibility of transforming the crisis and the risks it carries into opportunities to unleash the innovative capabilities that exploit the crisis as an opportunity to reformulate conditions and find appropriate solutions (Hijjawi & Mohammad, 2019; Alameeri et al., 2020; Al-Dhuhouri et al., 2020). The real role of the innovative leader lies in revealing and investing the innovative energies of his followers, and working to make his organization learn innovation and creativity continuously (Al-Hawary et al., 2013; Al-Hawary & Hadad, 2016; Al-Hawary & Alhajri, 2020; Harahsheh et al., 2021).

Public institutions in the State of Qatar work like other institutions, facing environmental conditions, with a high degree of uncertainty and severe environmental

complexity, which leads It calls for the necessity of a creative leadership approach, according to a management methodology, that focuses on developing crisis management strategies, so that this leads to relying on finding products/services at a lower cost, and with flexibility that enables them to adapt to emerging changes that affect them in light of the threats they face, also, adopting an approach of creativity to develop the products/services provided by public institutions in the State of Qatar, and to improve the quality of the products offered to customers. Through the researcher's extrapolation of the general climate in the State of Qatar, and the sector of public sector institutions in particular, he realized that public institutions are among the most prominent sectors that have witnessed changes and new challenges, in the crisis of the blockade, which posed a major challenge to these institutions; Therefore, public institutions in the State of Qatar are required to improve their products and enhance their competitiveness indicators, especially in the midst of the challenges the world is witnessing.

In general, the success of these institutions requires keeping pace with the new developments of strategic management. Strategic intelligence is also considered an advanced field (Al-Hawary & Ismael, 2010; Al-Hawary et al., 2020; Al-Nady et al., 2013; Alzoubi et al., 2022). It is considered one of the important tools that enable these institutions to deal with the environmental uncertainty they face, and it is an important factor in supporting and coordinating all efforts to unify them in order to achieve the strategic goals efficiently and effectively (Al-Dmour et al., 2021; Ashal et al., 2021; Shakhour et al., 2021). Due to the scarcity of studies that dealt with the impact of innovative leadership on crisis management strategies, especially in the work environment in the State of Qatar, the problem of the current study appears in analyzing the impact of innovative leadership in its dimensions (problem solving and decision-making, susceptibility to change, initiative, ability to communicate, stimulating creativity, and innovative knowledge), in crisis management strategies in its dimensions (early warning strategy, preparedness and prevention strategy, damage containment strategy, recovery strategy, learning and growth strategy) in public institutions in the State of Qatar.

2 Theoretical Framework and Hypothesis Building

2.1 Innovative Leadership

Leadership is one of the most important approaches to developing strategic performance. Because of its important role in influencing employees and directing their ideas and behavior in order to achieve the goals sought by the institution, because it has a significant impact on their behavior, performance and productivity at work. Innovative leaders are satisfied not only by rearranging existing organizational structures, but are motivated by the constant quest for a better way (Al-Hawary, 2015; Al-Hawary & Abu-Laimon, 2013; Al-Hawary & Alajmi, 2017).

The innovative leadership style is discovery and self-renewal and their impact contributes to achieving the general interest and raises the awareness of the leadership, followers and the institution as a whole, and the innovative leader is able to collect new ideas with each other in an individual way that organizes their unconnected relationship, and make them a focus of innovation (Al-Hawary & Al-Namlan, 2018; Allozi et al., 2022; Metabis & Al-Hawary, 2013). The term leadership is one of the concepts that have received great interest by researchers and those interested, as this concept has appeared in several different definitions due to the different views of researchers and the different approaches to studying this concept. Leadership is one of the most important topics that researchers have studied in depth, and despite the diversity and multiplicity of research and studies, they did not reach agreement on the concept of leadership.

The meaning of innovation in the business dictionary is to provide a new method, or a new service, which is the ability to find solutions to problems and crises through a new tool or a new technical effect, and it has been defined as the process that leads to the creation of a new idea and its output through a useful product or service, or methods of Operations (Al-Hawary & Aldaihani, 2016; Al-Hawary & Alwan, 2016; Al-Hawary & Nusair, 2017; Dogan, 2019). Other researchers also defined innovation it as a combination of abilities, preparations, and characteristics of a person which, if found in an appropriate environment, can elevate mental processes to lead to original and useful products, whether in relation to the individual's previous experiences or to the experiences of the institution, society or the world if the results are on a level of creative breakthroughs in one of the fields of human life (Hamdi, 2018).

The link between leadership and innovation is important in the success of the continuation of creative processes within society and in the development and creation of the creative climate. Innovative leaders are not only satisfied with rearranging the existing structures but are motivated by the continuous quest to find a better way. The creative leadership style is discovery and self-renewal, and their impact contributes to achieving the broader interest and raises the awareness of leadership, followers and the institution as a whole (Al Dukan, 2010). Innovation gives leadership characteristics that distinguish it from other leaders, such as openness towards change, the desire to identify internal problems and issues, in addition to giving the ability to control the environment in which he lives, confidence in the ability of others to achieve and bear responsibility, respect for others' choices, and the ability to rush towards learning and using culture, appreciating the achievements of others, and moving towards the future with full force (Al-Zubaidi & Al-Mamouri, 2015; Abuhashesh et al., 2021; Hamadneh et al., 2021).

It becomes clear that the innovative leadership in the organization is the innovator who translates knowledge into choices and who has ideas that are new and useful and related to solving specific problems or re-combining known patterns in unique forms (Al-Nady et al., 2016; Allahow et al., 2018; Alhalalmeh et al., 2020). Al-Saghir and Muhammad (2017) referred to creative leadership as the ability to change, renew or The development of a new approach or method, and its use of modern technologies that are compatible with the requirements of the environment and the aspirations of the modern era and meet the needs of the institution, on the other hand is the

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ability of the leader to use familiar things in an unfamiliar way, and to propose innovative ideas and solutions to the problems and issues he deals with, characterized by novelty, quality and feasibility. The traits of creators may be available, all or some of them, in the leader of the organization who has the ability to be innovative, and the absence of some of these traits does not mean her inability to lead the organization in a innovative way, but rather they are helpful and influential traits that develop creativity and creativity in the leader, and those in charge of the organization must take appropriate methods to develop these features. Innovative leadership has a set of basic features that appear to influence the behavior of leaders.

For the purposes of this study, the following dimensions were adopted: **Problem-solving and decision-making**: The sensitivity to problems and decision-making is one of the most important characteristics of leadership, as a innovative leader has the ability to face a situation that involves a problem or several problems that need to be solved or change, **Changeability**: The emergence of many changes and the many challenges facing the institution, which need a creative leader who can face those challenges, and come up with innovative solutions and proposals about them, especially after the institution's application of some administrative trends, which gave the institution more empowerment and independence to achieve self-renewal to enable the institution to Achieving a competitive advantage (Al-Jaafira, 2013). **Initiative**: It refers to the ability to be innovating and to act consciously and quickly in various situations. It is a characteristic of innovation and an administrative principle. Initiatives appear in a healthy climate that motivates workers and encourages them to take initiatives. It is the characteristic of an innovative leader who encourages the spirit of initiative. He takes the initiative and shows his initiative in making decisions that bring about important changes (Abdul Qader, 2012)**. Ability to communicate**: Communication aims to identify ideas, information and directions through a social system and the ways in which opinions, trends and knowledge are formed. **Stimulating innovation**: It is a paragraph about a mental characteristic that enables the individual to think in unconventional ways, or as it is known and popularized "thinking outside the box, which contributes in one way or another to creativity of all kinds or the use of different, unusual methods while dealing with a specific task or issue. This requires good preparation by the higher management of the institution (Al-Zubaidi & Al-Mamouri, 2015). **Innovative knowledge**: It is the knowledge that gives the institution the ability to lead the sector, and in the case the institution's differentiation is clear compared to competitors, which enables it to change the rules of the game in the style and timing that it determines, and through the knowledge pyramid, it can be said that it contributes well to clarifying how to form and build the knowledge system.

2.2 Crisis Management Strategies

The concept of crisis has several meanings, including a sudden change to the worst and the risks and opportunities it entails to restore conditions to their normal

state and find constructive solutions, or in other words, it is a turning point in unstable conditions, or a series of events that have a negative impact on the institution (Al-Zubaidi & Al-Mamouri, 2015). As for crisis management, it is the method of dealing with the crisis by the administrative and methodological processes that leaders in institutions adopt to confront the crisis before, during and after its occurrence, control and prevent it, and try to predict it by developing and implementing plans, and taking appropriate decisions through the necessary information and providing an effective communication system, achieving the desired goals, in minimal losses, cost and effort (Bobyleva & Sidorova, 2015; Alzoubi et al., 2021; Tariq et al., 2022).

The concept of crisis management refers to how to overcome the crisis by using scientific administrative methods in order to avoid its negative aspects as much as possible and maximize its answers, and crisis management is a purposeful activity based on research and obtaining the necessary information that enables management to predict the locations and trends of the expected crisis and create the appropriate climate To deal with it by taking measures to control the expected crisis**.**

The administrative literature has included a number of strategies for dealing with crises according to their nature, where the crisis differs in terms of its type, severity and causes, the goal of facing crises is to seek the available human and material capabilities to manage the situation. Therefore, the method of dealing with crises is the determinant of the management's efficiency in facing them. Accordingly, dealing with crises had to be subject to the scientific administrative approach to confirm the success factors and protect the administrative entity from any uncalculated change and secretions, present or future. Contemporary administrative thought has resulted in a set of strategies, and these strategies are consistent with the contents of technological and administrative developments, and are in agreement to some extent with the modern trends adopted by institutions towards workers and all stakeholders, taking into account the positive image of the institution, taking into account the achievement of community interest and deepening the institutional role of the organization in society (Al-Lami & Al-Issawi, 2016).

2.3 The Relationship Between Innovative Leadership and Crisis Management

The personality of the leader is clearly reflected on the institution and its management, especially when emergency matters or crises occur in the institution. The leader's adoption of a certain behavior inevitably includes the performance and satisfaction of employees to directly affect the effectiveness of the institution and depending on the nature of the crisis as an opportunity or a threat, managers and leaders of institutions may resort to changing their behavior between centralization and decentralization of crisis management, he resorts to the first type when the cause of the crisis is internal

and when the institution's ability to control external factors weakens, the leader resorts to (decentralization) and because the crisis started outside the institution, the leader needs information about the crisis and it is natural for him to resort to middle and executive management, and thus (decentralization) is a preferred method for such a situation.

Researchers believe that many institutions are exposed to different crises in which the leader exhibits different patterns and behaviors. It is obvious that the leader deals with every crisis that occurs in different patterns, so what works for managing a crisis may not work for another crisis. The crisis is a catalyst for the emergence of different types of behavior and therefore different responses to crises. Also, cooperation and respect between the leader and the workers and between them facilitates the process of containing the crisis, in order to reach the optimal leadership style, more than one style can be used at the same time. As there is no fixed leadership style that the leader follows in all situations, and the strategies used to solve the crisis are determined according to the type and severity of crises and the characteristics of leadership qualified to overcome crises, and an attempt to diagnose the nature of the relationship between the strategy used by the administrative leader in the face of the crisis and the type, severity and reasons for the occurrence of the crisis.

Al-Kaabi (2014) said that there is a significant effect relationship between successful administrative leadership and crisis management. The study of Svejenova reached several results, stating the importance of the concept of innovative leadership in the context of social change, as it increases the understanding of creative industries by proposing a social purpose as a distinctive and open engine for innovation and a different source of budget, as well as significant limits to research and practice in the creative industries. The study of Ghosh (2016) confirmed that the innovation of leaders is subject to several influences, the most important of which are technical support at work and their level of creativity, and the leadership style has positive effects on innovation. **Based on the above literature, the study hypotheses may be formulated as**:

There is a significant effect of innovative leadership on the crisis management strategies.

3 Study Model

See Fig. 1.

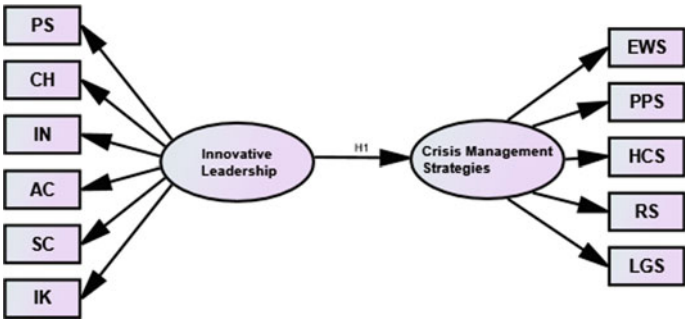

Fig. 1 Research model

4 Methodology

4.1 Population and Sample Selection

A quantitative method based on a questionnaire was used in this study for data collection and sample selection. The major aim of the study was to examine the impact of innovative leadership practices on crisis management strategies in public institutions in the State of Qatar. Data were primarily gathered through the questionnaires which were distributed to a random sample of (380) postgraduate students. In total, (327) responses were received including (53) invalid to statistical analysis due to uncompleted or inaccurate. Hence, the final sample contained (346) responses suitable to analysis requirements that were formed a response rate of (86.05%), where it proved to be sufficient to the extent that was predictable and allowed for a presumption of data saturation (Sekaran & Bougie, 2016).

4.2 Measurement Instrument

A questionnaire that consists of two main sections along with a section regarding control variables was used as the measurement instrument. Control variables considered as categorical measures were composed of gender, age group, educational level, and experience. The two main sections were dealt with a five-point Likert scale (from 1 = strongly disagree to 5 = strongly agree). The first section contained (24) items to measure innovative leadership based on Zhang et al. These questions were distributed into dimensions as follows: four items dedicated for measuring problems solving and decisions making, four items dedicated for measuring changeability, four items dedicated for measuring initiate, four items dedicated for measuring ability to communicate, four items dedicated for measuring stimulating creativity and four items dedicated for measuring innovative knowledge. Whereas the second section included (15) items developed to measure crisis management strategies according to

what was pointed by Eliadis. This variable was divided into five dimensions: early warning strategy that was measured through five items, preparedness and prevention strategy which measured by five items, Harm containment strategy was measured using five items, recovery strategy that was measured by five items and learning and growth strategy was measured using five items.

5 Findings

5.1 Measurement Model Evaluation

This study was conducted structural equation modeling (SEM) to test hypotheses, which represents a contemporary statistical technique for testing and estimating the relationship between factors and variables (Wang & Rhemtulla, 2021). Accordingly, the reliability and validity of the constructs were tested using confirmatory factor analysis (CFA) through the statistical program AMOSv24. Table 1 summarizes the results of convergent and discriminant validity, as well the indicators of reliability.

Table 1 shows that the standard loading values for the individual items were within the domain (0.520–0.820), these values greater than the minimum retention of the elements based on their standard loads (Al-Lozi et al., 2018; Sung et al., 2019). Average variance extracted (AVE) is a summary indicator of the convergent validity of constructs that must be above 0.50 (Howard, 2018). The results indicate that the AVE values were greater than 0.50 for all constructs, thus the used measurement model has an appropriate convergent validity. Rimkeviciene et al. (2017) suggested the comparison approach as a way to deal with discriminant validity assessment in covariance-based SEM. This approach is based on comparing the values of maximum shared variance (MSV) with the values of AVE, as well as comparing the values of square root of AVE ($\sqrt{}$AVE) with the correlation between the rest of the structures. The results show that the values of MSV were smaller than the values of AVE, and that the values of $\sqrt{}$AVE were higher than the correlation values among the rest of the constructs. Therefore, the measurement model used is characterized by discriminative validity. The internal consistency measured through Cronbach's Alpha coefficient (α) and compound reliability by McDonald's Omega coefficient (ω) was conducted as indicators to evaluate measurement model. The results listed in Table 1 demonstrated that both values of Cronbach's Alpha coefficient and McDonald's Omega coefficient were greater than 0.70, which is the lowest limit for judging on measurement reliability (De Leeuw et al., 2019).

Table 1 Results of validity and reliability tests

Constructs	1	2	3	4	5	6	7	8	9	10
1. PS	–									
2. CH	0.54	–								
3. IN	0.62	0.57	–							
4. AC	0.82	0.80	0.84	–						
5. SC	0.59	0.62	0.55	0.69	–					
6. IK	0.61	0.48	0.61	0.67	0.57	–				
7. EWS	0.62	0.51	0.63	0.63	0.69	0.58	–			
8. PPS	0.69	0.61	0.68	0.78	0.82	0.76	0.65	–		
9. HCS	0.45	0.55	0.42	0.62	0.74	0.44	0.59	0.74	–	
10.RS	0.57	0.74	0.65	0.55	0.74	0.55	0.66	0.53	0.66	–
11. LGS	0.77	0.80	0.74	0.65	0.69	0.53	0.45	0.48	0.59	0.70
VIF	2.580	2.384	1.777	1.460	1.670	1.884	–	–		
Loadings range	0.520–0.820	0.614–0.880	0.685–0.750	0.508–0.721	0.694–0.772	0.518–0.787	0.568–0.819	0.788–0.892	0.644–0.795	0.577–0.835
AVE	0.741	0.692	0.684	0.669	0.609	0.685	0.593	0.709	0.633	0.684
MSV	0.522	0.587	0.594	0.588	0.627	0.628	0.522	0.574	0.609	0.622
Internal consistency	0.844	0.957	0.883	0.795	0.869	0.922	0.912	0.888	0.844	0.839
Composite reliability	0.827	0.798	0.843	0.877	0.819	0.887	0.778	0.759	0.7490.738	0.833

5.2 Structural Model

The structural model illustrated no multicollinearity issue among predictor constructs because variance inflation factor (VIF) values are below the threshold of 5, as shown in Table 1 (Hair et al., 2017). This result is supported by the values of model fit indices shown in Fig. 1.

The results in Fig. 2 indicated that the chi-square to degrees of freedom (CMIN/DF) was 2.0002, which is less than 3 the upper limit of this indicator. The values of the goodness of fit index (GFI), the comparative fit index (CFI), and the Tucker-Lewis index (TLI) were upper than the minimum accepted threshold of 0.90. Moreover, the result of root mean square error of approximation (RMSEA) indicated to value 0.038, this value is a reasonable error of approximation because it is less than the higher limit of 0.08. Consequently, the structural model used in this study was recognized as a fit model for predicting the DEP and generalization of its result (Ahmad et al., 2016; Shi et al., 2019). To verify the results of testing the study hypotheses, structural equation modeling (SEM) was used, the results of which are listed in Table 2.

The results demonstrated in Table 2 show that all innovative leadership dimensions have a positive impact relationship on crisis management strategies. However, the

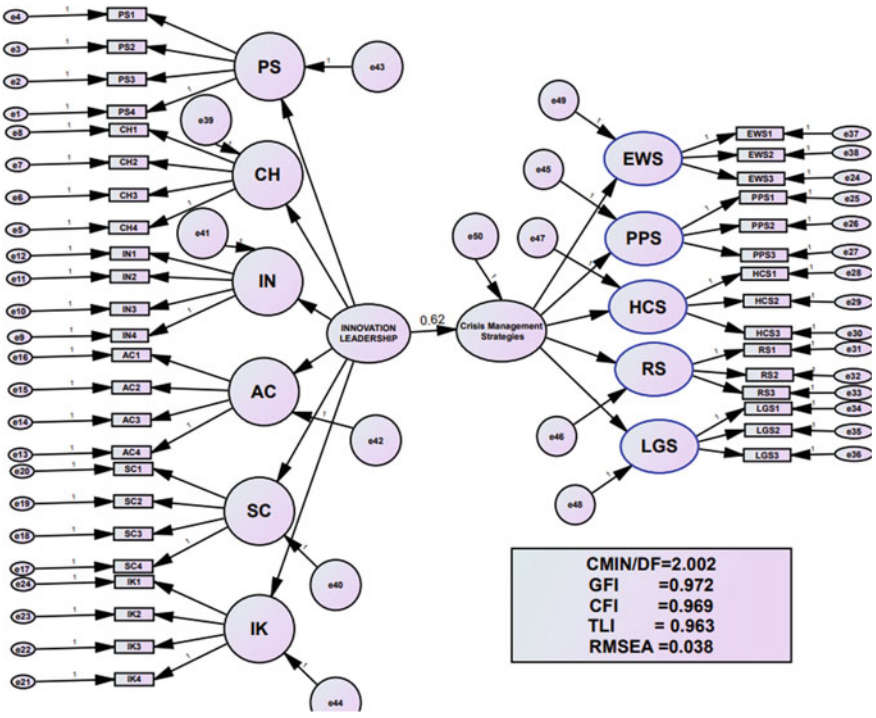

Fig. 2 SEM results of the digital marketing effect on mental image

Table 2 Hypothesis testing

Hypothesis	Relation	Standard beta	*t* value	*p* value
H1	Problems solving and decisions making → crisis management strategies	0.106	*8.912	0.000
H2	Changeability → crisis management strategies	0.109	*9.909	0.000
H3	Initiate → crisis management strategies	0.148	*13.910	0.000
H4	Ability to communicate → crisis management strategies	0.250	*14.176	0.000
H5	Stimulating creativity → crisis management strategies	0.247	*13.368	0.000
H6	Innovative knowledge → crisis management strategies	0.246	*11.900	0.000

results indicated that the highest impact was for combination ($\beta = 0.250$, $t = 14.176$, $p = 0.000$), followed by stimulating creativity ($\beta = 0.247$, $t = 14.368$, $p = 0.000$), and finally the lowest impact was for problems solving and decisions making ($\beta = 0.106$, $t = 8.912$, $p = 0.000$).

6 Discussion

The results showed that there is an impact of innovative leadership on crisis management strategies in public institutions in the State of Qatar, which means that public institutions in the State of Qatar follow sound methods in their keenness to exercise the dimensions related to innovative leadership in terms of problem solving, decision-making, changeability, initiative, and ability to Communication, stimulating innovation, innovative knowledge. It also shows the interest in crisis management strategies through the interest of leaders in public institutions in the State of Qatar in innovative leadership in terms of paying attention to the early warning strategy as the first stage in crisis management, which is the stage of discovering danger signs of a crisis, and these signs appear early, because the crisis is usually sent long before it occurs A long series of early warning signs, or symptoms that predict the possibility of a crisis, and unless attention is paid to these signs, it is very likely that a crisis will occur.

It is also a warning stage for sensing the crisis and is represented by the first signs and premonitions that warn of a crisis, and if it is not realized, the crisis stage comes quickly, and the warning may be direct and can be perceived and it may be the opposite. On the other hand, he showed the interest of the Public Institutions Department in the State of Qatar in strategic leadership practices. In the strategy of preparedness and prevention in terms of taking a set of prevention methods required at the stage of risk discovery, prevention includes discovering weaknesses and strengths in order to address them, and accordingly the institution must have sufficient preparations and

methods to prevent crises. The results of the current study is consistent with Hamdi (2018), which dealt with the impact of innovative leadership on crisis management in the Jordanian telecommunications sector, and Al-Qahtani (2012), which dealt with the reality of the practice of innovative leadership among secondary school principals in Riyadh from the point of view of principals and supervisors, and the results of Saed (2016), which dealt with the role of innovative leadership in improving the level of organizational culture in the Palestinian Ministry of Health.

7 Recommendations

According to the findings of the analysis, the researchers present a number of recommendations to decision-makers to enhance the desired results from the application of the dimensions of creative leadership in adopting crisis management strategies in public institutions in the State of Qatar through interest in creating strong and solid strategic partnership relationships with strategic partners in the internal environment of a Qatari state, as well as the external environment at the level of countries and regional and global institutions, and work on developing the capabilities of the leaders of public institutions in the State of Qatar through training in skills and methods of solving problems in scientific ways through scientific thinking and focusing on predicting problems before they occur. And the need for public institutions in the State of Qatar to pay attention to indicators of growth and leadership, such as training on brainstorming sessions, new ways and methods of work, generating creative ideas, enhancing innovative knowledge, and trying to inform them of what is being developed of creative methods and thinking outside the box.

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A Systematic Review on the Influence of Entrepreneurial Leadership on Social Capital and Change Propensity

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Abstract The last three decades have been characterized by an increased number of research studies examining how the management of organizations has become a critical area of concern in modern literature. This paper presents a systematic literature review of the influence of entrepreneurial leadership on social capital and change propensity. The work clearly states the research question on how these variables affect a firm's success. The methodology involved drawing ideas from recent studies that have explored the association between leadership styles and an organization's ability to achieve consistent social capital and effective change management. Relevant literature was accessed on Google scholar search and used to examine the relationships between the variables. This study seeks to fill a gap in the literature by presenting a theoretically-grounded methodology that helps leaders design and adopt approaches that focus on achieving and integrating social capital in managing change in organizations.

Keywords Systematic review · Entrepreneurial · Leadership · Entrepreneurial leadership · Change propensity · Social capital

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_81

1 Introduction

Entrepreneurial leadership is the cornerstone of development for any organization that aims at achieving outstanding milestones in business. While various researchers have focused on the importance of proper management of companies, there is a need for methodical approaches to assess the significance of actualizing social capital to initiate and implement change processes (Chitsaz et al., 2019; Dean & Ford, 2017; Ximenes et al., 2019). The paper provides the literature review based on the role of entrepreneurial leadership in articulating common organizational values, vision, risk-taking, effective communication, and creativity.

A number of scholars have drawn parallels between social capital and change propensity historically and conceptually (Clark et al., 2019). In this emerging concept, some scholars define entrepreneurial leadership within a narrow view, specifically within the context of small businesses (Alameeri et al., 2021; Dost et al., 2018; Felix et al., 2019; Leitch & Volery, 2017; Mehmood et al., 2019a; Yani et al., 2020). Although it may appear as if there is a single leadership approach to the actualization of social capital, a closer examination would reveal that numerous strategies may be necessary to align these to favor the propensity of change within an organization. Alameeri et al. (2021), Al-Dhuhouri et al. (2021), AlShehhi et al. (2021), Harahsheh et al. (2021), Madi Odeh et al. (2021), Mehmood et al. (2019b) argued that this new paradigm of management stretches beyond the convergence of fields and is linked to the characteristics of leadership styles across diverse conditions and contexts.

The purpose of this paper is to provide an insight into the development of entrepreneurial leadership. The resulting systematic literature review and discussion delve into providing a conceptual map of the prevailing state of research in the new paradigm with a view of identifying directions into future studies. It provides a benchmark for further investigation into the influence of entrepreneurial leadership on social capital and inclination to change.

2 Research Question

Does entrepreneurial leadership influence the development of social capital and enable organizations to have a high propensity to change?

3 The Motivation to Investigate the Research Question

Current studies have explored the link between leadership style and the organizations' ability to attain social capital and effective change management. Nevertheless, there is growing confusion because these studies claim that such a relationship depends

on the leadership approach. Despite its growing influence on the two aspects of business, most of these studies undermine the role of entrepreneurial leadership in developing social capital and the ability of the organizations to cope with emerging changes in the business environment. Besides, studies attempting to explore the link between entrepreneurial leadership and social capital have appeared to ignore this leadership strategy's role by contending that social capital only associates with transformational and democratic leadership approaches (Abu Zayyad et al., 2021; Al Kurdi et al., 2021; Allozi et al., 2022; Al-Maroof, et al., 2021; Alshurideh et al., 2019). Other researchers have argued that social capital depends on multiple factors, including individual attitudes and behaviors in the workplace (Al Khasawneh et al., 2021a, 2021b; Aljumah et al., 2021; Almazrouei et al., 2021; Nuseir et al., 2021; Refae et al., 2021). Therefore, there is a need to determine the role of entrepreneurial leadership in developing social capital and effective change management.

4 Research Methodology

The primary method that would be applied in the literature review is the systematic review methodology. It involves a critical description and appraisal of current and previous studies associated with a particular research inquiry to determine relationships between themes and ideas (Ahmad et al., 2021; Al Naqbia et al., 2020; Al Suwaidi et al., 2021; Alhashmi et al., 2020; Alshamsi et al., 2021; Bazan et al., 2020; Linares-Espinós et al., 2018; Mehmood et al., 2019c; Mehrez et al., 2021; Mishra & Misra, 2017). The systematic review strategy will involve two significant steps: identifying the research process and determining which secondary research sources would help provide the study with the resources (Ahmad et al., 2021; Alhashmi et al., 2020; Assad & Alshurideh, 2020; Bettayeb et al., 2020). The study will adopt two search strategies. The first one will involve using Google Search Engine to locate studies relevant to the systematic review. The second one will include using specific searching terms and phrases such as "influence of entrepreneurial leadership on social capital" or influence of entrepreneurial leadership on change management."

5 Tabulated Systematic Literature Review

Author/s	Year	Title	Sample	Country of origin	Main aspect	Method	Main findings	Future directions
Mamun et al. (2018)	2018	Entrepreneurial leadership, performance, and sustainability of micro-enterprises in Malaysia	100 people	Malaysia	Establishing the link between entrepreneurial leadership, performance d sustainability of micro-enterprises	Cross-sectional research design	Entrepreneurial leadership contains emotional intelligence that sustains micro-enterprises	Future studies should incorporate relevant constructs in the present model to explain detailed aspects of entrepreneurial leadership in relation to achieving social capital and change mobility
Leitch and Volery (2017)	2017	Entrepreneurial leadership: Insights and directions	Sampled previous studies/no Primary study	Not specified	Providing insights and directions about the link entrepreneurial leadership and its impact on social capital		Entrepreneurial leadership is still evolving. It lacks appropriate tools to determine its traits and nature	Should focus on determining the key attributes of entrepreneurial leadership

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Author/s	Year	Title	Sample	Country of origin	Main aspect	Method	Main findings	Future directions
Mishra and Misra (2017)	2015	Entrepreneurial leadership and organizational effectiveness: A comparative study of executives and non-executives	410 workers for India's firms	India	Determining the relationship between entrepreneurial leadership and organizational effectiveness		Executives and non-executives differed on the role of this leadership style on a firm's effectiveness	Future studies should include other organizational variables to draw possible links
Mehmood et al. (2019b)	2019	Impact of Entrepreneurial Leadership on Employee's Innovative Behavior: Mediating role of Psychological Empowerment	301 managers and employees of SMEs	Pakistan	The mediating role of psychological empowerment that entrepreneurial leaders have on workers		Entrepreneurial leadership has a direct impact on intelligent behaviors in workers and an indirect impact on intelligent behavior through psychological empowerment	Future researchers must adopt longitudinal to validate the existing link between entrepreneurial leadership and intelligent behavior

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Author/s	Year	Title	Sample	Country of origin	Main aspect	Method	Main findings	Future directions
Ranjan (2018)	2018	Entrepreneurial leadership: a review of measures, antecedents, outcomes, and moderators	Review of 50 studies	India	Reviewing measures, antecedents, outcomes, and moderators. Examining the dimensions of Entrepreneurial leadership (strategic factors, communicative factors, motivational factors, personal factors, and leadership behaviors		The research discovered EL traits, including ambitiousness, performance-oriented, diplomatic behaviors, inspiration, positive attitude, intellectual stimulation	Extend future research on the possible link between the mentioned constructions and employee performance
Yang et al. (2019)	2019	Entrepreneurial Leadership and Turnover Intention of Employees: The Role of Affective Commitment and Person-job Fit	427 workers	China	The mediating role of affective commitment created by EL on-employee turnover intentions		The study discovered that EL promotes effective commitment, which eventually reduces employee turnover intentions	Future research can collect data from more companies to gather more insights into the relationship

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Author/s	Year	Title	Sample	Country of origin	Main aspect	Method	Main findings	Future directions
Ximenes et al. (2019)	2019	Entrepreneurial leadership moderating high-performance work system and employee creativity on employee performance	200 workers	Indonesia	Entrepreneurial leadership as a moderator of performance work systems, employee creativity, and performance		The research discovered that EL influences high-performance work systems, which eventually influence employee creativity and performance	The results could not be generalized. Hence, future studies should expand the scope of the study beyond cooperatives
Miao et al. (2018)	2018	How Leadership and Public Service Motivation Enhance Innovative Behavior	281 Chinese civil servants	China	How various leadership approaches influenced innovativeness in employees		Entrepreneurial leadership influences innovation in employees	Future researchers should use objective data to determine innovative behavior

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Author/s	Year	Title	Sample	Country of origin	Main aspect	Method	Main findings	Future directions
Cai et al. (2019)	2019	Does entrepreneurial leadership foster creativity among employees and teams? The mediating role of creative efficacy beliefs?	43 leaders and 237 employees	China	Using social cognitive theory, the researchers wanted to establish the link between EL, individual creativity, and team creativity		There is entrepreneurial leadership creativity generated by creative efficacy beliefs	Future research on this subject should focus on other countries that nurture collectivist cultural norms
Li et al. (2020)	2020	Impact of Entrepreneurial Leadership on Innovative Work Behaviour: Examining Mediation and Moderation Mechanisms	350	China	The influence of entrepreneurial leadership on innovative work behavior and culture among employees		There was a significant relationship between entrepreneurial leadership and innovative work behavior	The study relied on cross-sectional data of a single country. Future researchers should focus on more countries

6 Results

6.1 Entrepreneurial Leadership, Social Capital, and Change Propensity

Despite some studies ignoring the influence of entrepreneurial leadership on the organization's social capital, others have captured the issue and provided evidence for such relationships. First, it is vital to ascertain the nature and characteristics of entrepreneurial leadership before drawing the connection between the two subjects. To evaluate the critical attributes of entrepreneurial leadership, Leitch and Volery (2017) defined this leadership approach as one that involves influencing other individuals in a workplace to engage in collective efforts towards achieving shared goals. In a different study that explored entrepreneurial leadership in the context of organizational performance and sustainability, entrepreneurial leadership generally involves a combination of leadership and entrepreneurial capabilities (Mamun et al., 2018). Such combinations portray a hybrid leader who can effectively influence others to achieve a common goal, optimize risks, encourage innovation, and take advantage of presenting opportunities in a dynamic environment.

6.2 Entrepreneurial Leadership and Change Propensity

A propensity to change is the likelihood of a company to change its structure and functioning in response to emerging issues (Harrison et al., 2018; Sarabi et al., 2020; Sawaean & Ali, 2020). The research associates this unique potential of companies to high levels of innovativeness and creativity often nurtured through a careful application of the entrepreneurial leadership approach. As discussed by Dean and Ford (2017), entrepreneurial leaders discover and tap opportunities in a dynamic business environment to alleviate risks, create new ways of thriving, and increasing organizational innovativeness.

7 Limitations of the Literature Review

The research method used in this systematic literature review has numerous merits and demerits. A distinguished usefulness of the methodical search is the use of up-to-date and peer-reviewed sources to provide applicable responses to the research question. Nonetheless, the literature review has been restrained by the phrases "influence of entrepreneurial leadership on social capital" and the "influence of entrepreneurial leadership on change management" used to identify and retrieve the information. As a result, further studies should look for better sources that have not been included

in the synthesis. The approach to selecting the vital terms and keywords was intentionally meant for the identification of reliable literature on the relationship between entrepreneurial leadership and achievement of social capital in organizations. The second limitation of the study was that the search method was constrained to publications written in the English language, which led to a bias inclining to research conducted in English-speaking countries.

8 Directions for Future Research

As highlighted by the systematic literature review, the concept of entrepreneurial leadership opens vast opportunities for further research. Although this area of study has drawn increased attention recently, the influence of entrepreneurial leadership on social capital and change propensity has received little consideration (Ha et al., 2020). Intellectual developments in this concept have presented researchers with opportunities to explore the role and influence of leaders in shaping the abilities of workers to accept change processes (Dabić et al., 2021; Obeidat et al., 2021; Pasricha & Rao, 2018). Since entrepreneurs from different countries face unique challenges due to discrepancies in GDP per capita, policies and conditions suitable for business may not favor them equally (Al-Gasaymeh et al., 2015, 2020; Al-Jarrah et al., 2012; Hsiao et al., 2016; Hsu & Chen, 2019; Setini et al., 2020; Theodoraki et al., 2018). The review has raised questions that would be useful in conducting future research. For instance, how can entrepreneurial leadership attributes be developed to realize social capital and change propensity? Consequently, there is a need to carry out further surveys to come up with a definitive model of entrepreneurial leadership that clearly expresses the link between the mentioned variables.

9 Conclusion

Many studies undermine the role of leadership styles in actualizing social capital and effective change management in organizations. While many of the authors acknowledge that little research has been done to draw relationships between social capital and change propensity, the systematic literature review proves that entrepreneurial leadership is a relatively new area of study. Nonetheless, facts from the review indicate that it is an essential factor in the development of an enterprise through capitalization on human resources and active management of change. The findings of the study underpinned the conceptual development of management frameworks that promote shared values, vision, risk-taking, effective communication, and creativity. A concern that arose from the literature review is that some studies overlooked the influence of entrepreneurial leadership on the organization's social capital, while others adequately covered the issue by providing evidence for such relationships.

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Factors and Challenges Influencing Women Leadership in Management: A Systematic Review

Khadija Alameeri, Muhammad Alshurideh, and Barween Al Kurdi

Abstract Leadership and management have always been common among men, yet women are stepping and succeeding into these roles too. However, with any new change that is projected to a system, challenges arise to reach adaptation or even acceptance of the change. This paper aims in pointing out the challenges and difficulties faced by women in their leadership and management roles. Six factors were studied which are competence, perception, stereotyping, harassment, organizational culture, and gender inequality on the performance and participation of a person, and thus how they impact gender discrimination. The results have presented a set of impressive challenges faced by women in their leadership roles such as gender and sex-based discrimination, stereotyping, harassment, gender inequality and perceived incompetence. This paper articulates the importance of paying attention to the factors affecting women in leadership and management in order to empower them and decrease gender discrimination in the workspace.

Keywords Women leadership · Gender inequality · Stereotyping · Lack of competence · Discrimination · Harassment · Gender inequality

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_82

1 Introduction

Nowadays, it is increasingly evident that women hold leadership positions, and this is always a topic of discussion. In the modern period, many stereotypes formed over the centuries are beginning to be rethought in society, in particular, the idea that women are destined. The paper aims to consider certain difficulties that female leaders face. Regardless of gender, a successful leader should have a certain set of personal and professional qualities. Strong character, ability to lead people, responsibility, business sense—all that is necessary for the leader. Currently, both men and women can possess these traits. Despite this, there are differences between male and female forms of management. A woman leader rarely resorts to an authoritarian style of management, she most often uses persuasion methods, tries to motivate staff, and does not force them to fulfill their goals and objectives. In conflict situations and negotiations, she might often seek a compromise, rather than coercion, carefully considers decisions, taking into account the opinions of others.

Modern working people and women in management need to make maximum personal efforts to create real competition for men in the managerial labor market. The success of professional self-realization depends not only on competencies, creative and creative thinking; but also on the gender characteristics of the individual. They also have competitive qualities such as high educational potential, sociability, responsibility, integrity, and hard work. Some features of the career strategy of women are presented, the leadership style of which is individual. Each female leader uses the experience of other leaders, including men, often shows traditionally masculine qualities, of course, not forgetting about feminine qualities, but she always introduces a personal, individual component in her professional activity, which is always tuned for success.

2 Literature Review

There are a number of key factors and challenges that directly or indirectly affect women's leadership in management. In the manufacturing industry, it is important to note that women are influenced by their level of competence, family support, and emotional stability (Al Khayyal et al., 2021; Harahsheh et al., 2021; Klenke, 2017). It is mainly due to the fact that the given field puts a significant amount of stress on women. The study conducted in New York shows that women in the automotive industry are primarily affected by appointment criteria, work environment, and skills and knowledge, and all these factors are manifested in their overall performance (Glass & Cook, 2016). In addition, stereotyping plays a major role in determining a woman's success as a leader, because it hinders career progression (Brookes, 2010). Gender inequality and stereotyping are also critical factors that influence women of color substantially due to two main components, such as racism and sexism (Abuhashesh et al., 2021; Alshurideh et al., 2021; Sanchez-Hucles & Davis,

2010). In the context of trait, contingency, and behavioral leadership, women are more likely to be subjects of gender inequality and stereotyping, and harassment (Al Kurdi & Alshurideh, 2021; Ayman & Korabik, 2010; Nuseir et al., 2021). Therefore, various leadership approaches become more challenging for female managers (Alameeri et al., 2021; Allozi et al., 2022; AlShehhi et al., 2021).

Organizational culture is another important challenge to consider due to the fact that traditional leaders cannot fully adapt to the modern concept of diversity. Therefore, they tend to exclude women from key positions (Al-Dhuhouri et al., 2021; Eagly & Chin, 2010; Madi Odeh et al., 2021). The given factor also creates a thick glass ceiling which makes it difficult for women to climb to upper management positions (Glass & Cook, 2016). On certain occasions, women may lack competence in specific fields due to the absence of proper supervision and guidance (Klenke, 2017). The given factor might be manifested in the fact that there is gender inequality in educating and training female workers (Flick, 2015). Women are prone to experience significant challenges in the context of business and entrepreneurship (Alameeri et al., 2021; Gray, 2019; Mehmood et al., 2019). The factor of stereotyping women can hinder their ability to express outstanding leadership behavior (Chin, 2011). In counseling and negotiations, there are also elements of stereotyping that constrain them in leading a successful negotiation process (Levitt, 2010). Thus, the latter notion decreases women's overall performance in a number of industries.

The factor of discrimination against women is present across many nations. In India, gender inequality in the organizational environment alongside the local culture acts as a major factor diminishing the role of a woman as a leader (Swarup, 2014). In addition, a New Zealand study shows that specific programs allow women to regain their self-confidence in order to properly perform in managerial positions in an organization (Harris & Leberman, 2012). There is a problem of objectification of women's bodies which can be a key major factor in setting the perception of women's inferiority (O'Neill, 2019). The given faulty perception is a form of sexism, which prevents women to acquire upper-management occupations (Ibarra et al., 2010). Gender inequality is also affected by women's work and family problems, where they are in a vulnerable position of duality, where they need to care for their family and perform their male counterparts (Hideg & Shen, 2019). This issue is strengthened by the fact that stereotyping based on cultures and traditions is prevalent across all fields, such as politics and business (McLean & Beigi, 2016). These factors play a detrimental role in hindering women's performance in management and their ability to reach higher positions.

3 Methods

The methodology used was primarily manifested in a systematic review of recent literature on women's performance and participation in management and the workplace. A number of sources were searched for the most relevant and important keywords regarding the subject (Ahmad et al., 2021; Ahmed et al., 2021; Al Naqbia

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Table 1 Search cretira

Keyword search
"Women" AND "Leadership"
"Women" AND "Management"
"Women" AND "Discrimination"
"Women" AND "Career"

Table 2 Web search engines

Databases	Frequency
Google Scholar	51
SAGE Journals	32
Elsevier	17
Wiley Online Library	14
APA PsycNet	9

et al., 2020; Al Suwaidi et al., 2021; Alhashmi et al., 2020; Alshamsi et al., 2021; Assad & Alshurideh, 2020a; Bettayeb et al., 2020; Mehrez et al., 2021; Shah et al., 2021). These keyword searches are summarized and presented in Table 1. A total of 123 articles and books on the subject were screened and overviewed, from which 16 sources were selected. Table 2 shows the frequency and type of databases used in the literature search as done by other studies (Alketbi et al., 2020; Al-khayyal et al., 2020; Almaazmi et al., 2021; Almazrouei et al., 2021; AlMehrzi et al., 2020; Alsuwaidi et al., 2021, 2021; Alyammahi et al., 2021; Assad & Alshurideh, 2020b; Yousuf et al., 2021).

4 Results

In order to obtain and analyze major challenges affecting women in management, the primary external factors were summarized and categorized into six classes, which are competence, perception, stereotyping, harassment, organizational culture, and gender inequality. The detailed information on each source and the external factor discussed are demonstrated in Table 3. In addition, Table 4 shows how the given external factors and databases are correlated with each other. Inclusion/exclusion criteria are represented and demonstrated in Table 5 and the critical inclusion questions are listed in Table 6. Figure 1 demonstrates the flowchart of the study selection process. The result of the quality assessment process is presented in Table 7 and the research model is presented in Fig. 2.

The following hypotheses were generated:

H1a: Stereotyping has a negative effect on women's participation in management.
H1b: Stereotyping has a negative effect on women's performance in management.

Table 3 The papers' sources chosen and the external factors found

Authors	Dependent factors	Sample size	Place	Subjects	External factors
Ayman and Korabik (2010)	Performance	180 women	India	Employees	Harassment
Brookes (2010)	Participation	135 women	Nigeria	Employees	Stereotyping
Chin (2011)	Participation	85 women	Florida	Employees	Stereotyping
Eagly and Chin (2010)	Performance	80 women	New York	Employees	Organizational culture
Flick (2015)	Performance	85 women	Arizona	Employees	Gender inequality
Glass and Cook (2016)	Performance	120 women	New York	Employees	Organizational culture
Gray (2019)	Performance	90 women	Italy	Employees	Organizational culture
Harris and Leberman (2012)	Participation	70 women	New Zealand	Employees	Organizational culture
Hideg and Shen (2019)	Performance	95 women	US	Employees	Gender inequality
Ibarra et al. (2010)	Participation	150 women	New York	Employees	Perception
Klenke (2017)	Performance	110 women	Virginia	Employees	Competence
Levitt (2010)	Performance	115 women	US	Employees	Stereotyping
McLean and Beigi (2016)	Performance	100 women	US	Employees	Stereotyping
O'Neil (2019)	Performance	110 women	Chicago	Employees	Perception
Sanchez-Hucles and Davis (2010)	Performance	110 women	US	Employees	Gender inequality
Swarup (2014)	Performance	85 women	India	Employees	Gender inequality

H2a: Discriminatory organizational culture hinders women's participation in management.
H2b: Discriminatory organizational culture hinders women's performance in management.
H3a: Gender inequality acts as barrier for women's participation in management.
H3b: Gender inequality acts as barrier for women's performance in management.
H4a: Discriminatory perception negatively affects women's participation in management.
H4b: Discriminatory perception negatively affects women's performance in management.
H5a: The lack of competence hinders women's participation in management.
H5b: The lack of competence hinders women's performance in management.

Table 4 The external factors found connected to each database used

External factors	Databases					
	SAGE journals	Wiley online library	Google scholar	APA PsycNet	Elsevier	Total
Competence	0	0	1	0	0	1
Perception	1	0	1	0	0	2
Stereotyping	1	1	1	1	0	4
Harassment	0	0	0	1	0	1
Organizational culture	1	0	1	1	1	4
Gender inequality	2	0	1	1	0	4

Table 5 The used inclusion/exclusion criteria

Inclusion criteria	Exclusion criteria
Should involve the factors and challenges that influence women in management	Factors and challenges affecting women in management are not present
Should include possible causes of women discrimination in the workplace or organization	Possible causes of discrimination are not present
The study must be in English	Non-English sources

Table 6 The critical inclusion questions used

#	Questions
1	Are the subject and goals being specifically targeted women in management?
2	Does the study specify factors and challenges affecting women in management?
3	Are data collection and analysis methods adequate?
4	Does the study contribute to the current knowledge?

H6a: Harassment negatively affects women's participation in management.
H6b: Harassment negatively affects women's performance in management.
H7: Women's participation in management faces gender discrimination.
H8: Women's performance in management faces gender discrimination.

5 Discussion

Gender discrimination in the world of work is a multilateral phenomenon with a large number of different manifestations. Nevertheless, some researchers are convinced that discrimination is becoming the norm, while others, on the contrary, deny the very fact of its existence on the basis of sex. It is necessary to analyze the degree of

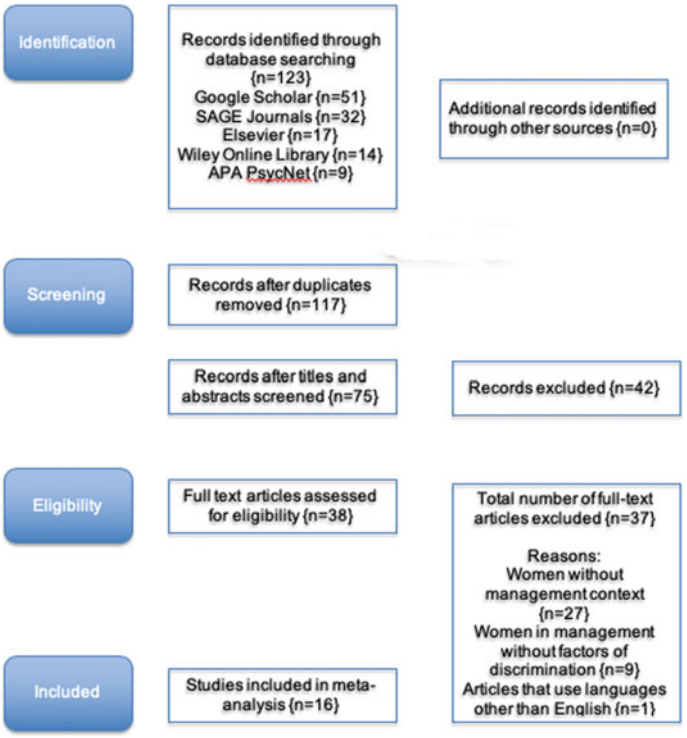

Fig. 1 Flow chart of selected studies

discrimination against women, that is, the extent and form of restriction of their rights in any sphere of public life, primarily industrial, but also family, social, political, and spiritual. This approach aims to explore the mechanism of integration of women in the entire system of government, society, and the economy. In fact, any social institution whose activity, the principle of gender equality, is deliberately violated can act as a subject of violence. Social discrimination of women is most expediently investigated in a double plan. On one hand, this is a social phenomenon that encompasses a large demographic community, consisting of various social, professional, age, and status groups. On the other hand, it is a social process with a successive change in the state of an object. Under the influence of external and internal conditions, objective and subjective factors, the process inherent in the sustainable interaction of female society with various social institutions and communities in order to achieve equal rights and opportunities, eliminate discrimination based on gender.

The forms of social discrimination of women, depending on the sphere of their activity, can be different. By its type, discrimination can be both violent and non-violent. In any case, the basis of discriminatory actions is violence against a woman's personality. A sociological study of social discrimination against women is based on data from a number of particular sociological factors. Among them, the concept

Table 7 The result of the quality assessment process used for each article

Study	Q1	Q2	Q3	Q4	Total	Percentage (%)
S1	1	1	1	1	4	100
S2	1	1	1	1	4	100
S3	1	1	1	0.5	3.5	87.5
S4	1	1	0	0.5	2.5	62.5
S5	1	1	1	1	4	100
S6	1	1	1	1	4	100
S7	1	1	1	1	4	100
S8	1	1	1	0.5	3.5	87.5
S9	1	1	1	1	4	100
S10	1	1	0	0.5	2.5	62.5
S11	1	1	1	1	4	100
S12	1	1	1	1	4	100
S13	1	1	1	1	4	100
S14	1	1	1	0.5	3.5	87.5
S15	1	1	1	0.5	3.5	87.5
S16	1	1	1	1	4	100

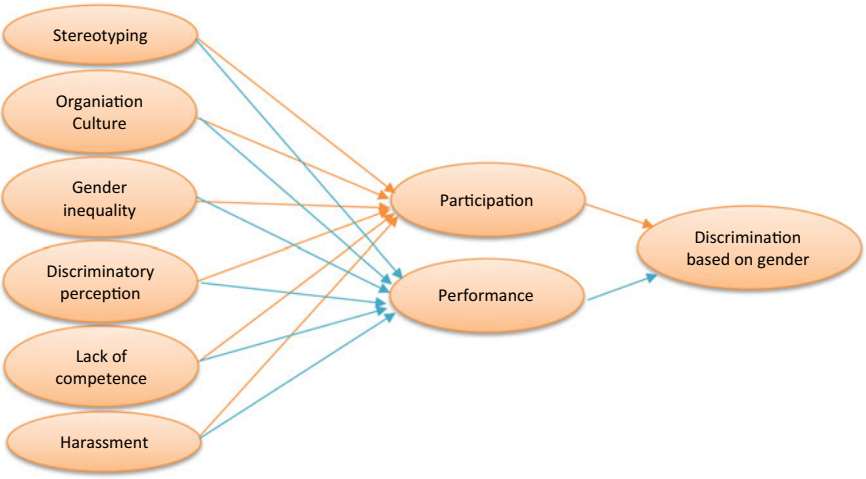

Fig. 2 The study proposed model

of gender identity reflects ideas about the field, and through their consciousness identified with it. Awareness of one's gender does not always correspond to the biological characteristics of an individual. The concept of gender ideals reflects public ideas about male and female behavior, in recent decades they have changed

significantly. The category of biological sex means taking into account the primary and secondary characteristics typical of men and women. The concept of sexual role is associated with the division of labor, with the rights and obligations of the sexes.

The female leader feels the surrounding world more subtly, does not go to an open conflict, which can harm. In relation to the staff, she is more open than men, she does not seek to keep her distance. She may be interested not only in the work process, but also in her personal life. This allows you to make the relationship more trusting, more friendly, which has a beneficial effect on the results of the work. A woman leader treats subordinates with warmth and attention, since maternal instinct is inherent in any woman. Women govern with instruments of influence based on horizontal connections, and men with instruments of power. Literary analysis has shown that there are few publications on gender management issues, all the more so when it comes to comparative analysis of gender theories. At the same time, the situation of women, who make up more than half of the population, reflects the state of society as a whole. Only recently, women began to actively occupy leadership positions, becoming the first persons of corporations, and even states.

The success of a woman as a leader and manager depends primarily on two factors—objective and subjective. The first is the efforts that the woman herself will make in order to achieve success in her career. The second is from stereotypes and views on it from the side and often from the side of men. That is, subjectively, a woman's career will depend on the social and cultural environment in which the woman rotates, and in which her personality and business environment are formed. As noted above, in general, assessments of the perception of women were the result of many factors—religious, political, social. The feminine principle was ontogenetically secondary and often subordinate to the masculine principle. In addition, it was the male sex who was the landowner and breadwinner, and this was also reflected in the legislation of that time. The birth of girls in the family was a painful and joyful event for the family and the financial conditions. The woman was completely subordinate to the man, both psychologically and economically.

However, over time, everything began to change. Nevertheless, the introduction of legal equality and a certain change in social roles could not completely distort the traditional patriarchal views. From the results, it seems that men continue to occupy top management positions, and women could be content only with grass-roots management. No one will deny the fact that a working woman is an everyday occurrence. However, the female leader sometimes causes some inhabitants some doubt and not many women manage to stand on the top of the career ladder. The reason for this difference is that female and male labor is evaluated differently, due to stereotyping. Perhaps with leadership, one must combine intuition, rigidity, and diplomacy, adhere to ethical standards and be philanthropic.

Gender features of the management style are very relevant issues in the psychology of management due to the fact that positive trends are currently emerging. When hiring a manager, they began to give preference to women, because, unlike men, they are characterized by a low level of empathy, communication skills, conservatism, and aggressiveness. Women not only unite employees, show sympathy, but also know how to motivate them to perform difficult tasks in critical situations (Gray, 2019).

Gender features of managerial activity are the characteristics of men and women leaders, manifested in the implementation of the main managerial functions, in the types and types of managerial decision-making, and the specificity of response to the impact of psychological factors of activity. Management style is a relatively stable system of methods, methods and forms of influence of a leader on subordinates in accordance with the goals of joint activities.

At the same time, in the analysis of managerial literature, the overwhelming majority of works clearly show latent discrimination against women. It is believed that the manager and specialist is necessarily a man, and the assessment of personality behavior, analysis of managerial situations, recommendations for the development of managerial decisions are given precisely from male positions. Moreover, the peculiarities of a woman's reaction to the external environment, the motivation of her actions, and personal characteristics are considered extremely limited. The reasons lie in the patriarchal views on the role of women, rooted in the mass consciousness. For centuries, a man raised the primary perception of a woman as the guardian of the hearth, the teacher of children, and the hostess in the kitchen. Each new appearance of a woman in management is presented as a sensation. At the same time, economic instability, periods of recessions, and booms predetermine the inevitability of a change in ideas about effective management.

It can be speculated that women quickly gain experience managing firms in situations of uncertainty. To counter stiff competition in modern conditions has become possible thanks to the involvement of women leaders practicing managerial style. This was mainly expressed in the development of more flexible forms of management orientation to an ever-changing situation. The introduction of a new mentality, style, methods inherent in the female management style into the renewed management has contributed to increasing the competitiveness of products through the search for the optimal combination of male and female management. Differences in the hierarchy of values, behavior, motivation between men and women are manifested in the desire to organize the management process in different ways. A woman is considered a more effective leader in the areas of staff motivation, communication, and decision-making processes. Speaking about the potential of women managers in management, it is important to note a number of features that confirm that the female management style is much richer. Firstly, a woman reacts more subtly to the moral and psychological climate in the team, relies on attention technology. Secondly, a woman is inclined to resolve a conflict situation, to experience the possible outcome of events.

The ever-changing change in social relations in the economy has led to serious problems in the employment of women, especially with regard to their career growth. Thus, the ongoing exclusion of women from the field of intellectual work, the employment of women in various sectors of the economy without formal employment, and discrimination against women in the workplace have determined the low level of women in the management sphere, and this despite the fact that working women make up a significant part of the working population. It is well known that professional activity is one of the main areas of personal self-realization. In professional

activities, a person reveals and shows his skills, communicative and professional qualities. It is this activity that allows a person to be a special individuality, to achieve recognition of their originality and originality, significance for other people, and the society as a whole.

A professional career should be considered as a process of self-realization of an individual in his main and socially significant sphere - in the form of a person moving from one professional status to another. This shows the special role of the individual and the mandatory coordination of the needs and capabilities of the individual with the competencies and qualification requirements of the profession. On the one hand, this means that a person was able to realize himself, and on the other, the fact that his activity was highly appreciated. In this regard, a caree—r is of great importance in the professional development of an individual. Career is an activity of conscious implementation of professional advancement, as a result of which a status appears that guarantees an acceptable level of social and professional recognition. The specifics of women's professional careers are the presence of sex-role stereotypes that affect the degree of manifestation of their career activity, as well as the personal characteristics of women, which result in the efforts made by them in the process of professional and career growth.

Moreover, these efforts are the main components of women's readiness to pursue a career. However, it is necessary to take into account the fact that not all women strive for leadership in the professional sphere. For some women, professional career and professional growth are in first place among life strategies and values, while for another part of women, work is supportive. This category of women does not seek to occupy a higher position, leadership positions, they self-actualize themselves in the family, they are quite satisfied with their position and salary. Thus, it is not possible to consider all women as a social group that has certain characteristics.

Modern employers prefer career-oriented women to work for them, and of course, it is not beneficial for them to have workers like mothers. The image of a housewife in society is supported mainly by men and is firmly fixed by the media. On the contrary, in professional activities, a woman overcomes a huge number of difficulties. These can be difficulties of both a socio-economic and political nature, such as a personnel management policy that limits the professional growth of women. This includes non-recognition of professional qualities by colleagues, unemployment, and fierce competition from men. Considering professional activity, it should be said about the self-realization of the personality, which is perceived as the realization of individual and personal capabilities of a person in their creative activity. A person realizes their own potential, a combination of knowledge, skills, creative abilities and abilities, as they realize their significance, goals of the activity, and methods of its implementation. The problem of professional self-realization is determined by the growth of requirements for professional activity and the growth of human attention to the expansion of their capabilities.

A professional career for men and women is built in different ways, therefore, it is necessary to determine the competitive qualities of women, the style of their leadership, and the urgent problems of women leaders. Currently, a woman has the right to choose the most attractive orientation to her family, professional or social

activities. However, women's leadership in real production continues to be quite low, due to some problems. Firstly, gender asymmetry has developed in the economy, with guaranteed equal rights for men and women in management, women, unfortunately, do not have equal opportunities with men to engage in leadership activities. On one hand, asymmetry is associated with objective difficulties in managing enterprises, and on the other, it is determined by patriarchal stereotypes of society.

Secondly, it is an entrenched patriarchal-conservative view of the leadership profession as a purely masculine one. It is worth paying attention to the fact that all the names of leadership positions are masculine and it becomes clear why a woman has to overcome a great many barriers to career growth in order to occupy the position of head of the organization. The modern world of business involves a masculine manner of behavior and lifestyle, and it is difficult for men to perceive women with power. Professionally independent women constantly come to grips with the male desire for excellence and the stereotypes that exist in society about female abilities. It turns out that women are forced to show their business qualities a hundred times more to be taken seriously. In this regard, the man himself is changing, with whom the fate of a prosperous wife is connected and there is a change in the principles for the redistribution of responsibilities in the household. Consequently, it can be stated that women have great difficulties in promoting their ranks. The success of a career in many respects depends on herself, on her personal qualities, on the ability to deal with stereotypical thinking in society. The reality is that women achieve success in work not as a result of copying the male management style, but through the use of their abilities, which provide a competitive advantage for women leaders over men.

One of the most important qualities is the industriousness of women is the ability to complete the work that has been started and to take responsibility, which is explained by the maternal instinct. Female executives might be better oriented towards users of the products of their enterprise, towards new services that the market needs (Aburayya et al., 2020; Al-Dmour et al., 2021; Al-Khayyal et al., 2021; Alshurideh et al., 2019; Alzoubi et al., 2020). The flexibility and diplomacy of women, combined with perseverance, allows them to more effectively build relationships with business partners and find mutual understanding and support. Femininity, charm, logic, developed intuition are often used by women leaders to solve the most complex and promising areas. Women managers can also be distinguished from men by greater democracy, willingness to cooperate, and collective decision-making with a skillful distribution of responsibilities between subordinates. Women leaders are probably more law-abiding, which leads to the establishment of constructive relations with authorities (Alshurideh, 2019; Alshurideh et al., 2016; Levitt, 2010; Svoboda et al., 2021). A detailed and thoughtful approach to solving problems, attention to detail, excellent friendship with numbers—all these qualities help female leaders to perceive and analyze details perfectly.

Thus, modern working women need to make maximum personal efforts to create real competition for men in the managerial labor market. An important role in the promotion of a specialist in the career ladder is played by the style of his communication with colleagues, and in the future, the style of leadership over them. Researchers study the similarities and differences between male and female leadership styles,

and they often disagree (Gray, 2019). The traditional view is that women choose relationship-oriented leadership because they are more emotional in nature and male leadership is characterized by perseverance and determination. There are only some features of the male and female leadership styles, which are determined by the difference in the psychological structure of personality in men and women. A woman effectively implements both survival strategies and development strategies, determining more cautious relationships with her colleagues and partners and, most importantly, avoiding risk strategies. The success of a woman in her career almost always changes the psychological microclimate of the family, as her authority as a mother and wife increases.

The first and most significant advantage is the high educational potential of women. In terms of education, women can lead in both higher and secondary vocational education. Female intuition, combined with a tendency to double-check information through various sources, allows you to choose the most favorable from a variety of decisions, understand the partnership, and evaluate the prospects of starting work. Compared to men, women can be distinguished by greater organization skills, determination, and consistency, which provides female leaders with the opportunity to perfectly notice and take into account any trifles in their work. Sociability is expressed in the fact that female managers use feedback opportunities better than men, they tend to trust behavior, they quickly adapt to changing conditions.

6 Conclusion

In conclusion, it is highly important to understand that factors and challenges affecting women's performance and participation in management are comprised of a multitude of forces. These can include gender and sex-based discrimination, such as stereotyping, harassment, gender inequality, perceived incompetence, and organizational culture. Most industries either do not provide sufficient knowledge and training to women or do not allow them to reach the upper-management and supervisory positions.

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The Relation Between Creative Leadership and Crisis Management Among Faculty Members at Imam Abdulrahman Bin Faisal University in Light of the Corona Pandemic from the Perspective of Department Heads

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Abstract The current study aimed to reveal the relation between the practice of creative leadership style and crisis management among faculty members at Imam Abdulrahman bin Faisal University (IAU), from the perspective of the heads of academic departments. A descriptive correlative approach was used by applying a questionnaire to a random sample of (100) Head of Department, during the second semester of the academic year 1442/1443. The findings revealed that faculty members practice both creative leadership and crisis management to a high degree. The study recommended holding training courses for faculty members, creating incentives systems and rewards, stimulating creative leadership among faculty members in universities, and spreading a culture of creativity.

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_83

Keywords Originality · Fluency · Containment · Escape

1 Introduction

The educational and academic sectors as any other sectors in all countries are influenced by emergent crises. However, these crises differ in terms of their quality, severity, and consequences, necessitating the development of effective ways for containing and managing them (Khairullah, 2010). Indeed, since we live in a constantly changing era, the emergence of crises has become commonplace in all business sectors; as a result, being attentive and aware of the effects of these crises has become a prerequisite to successfully managing their positive and negative impacts (Al-Khamees & Al-Salihi, 2019; Joghee et al., 2021; Svoboda et al., 2021). In this context, it is critical for decision-makers in Saudi Arabian universities to prioritize crisis management during the planning and organizing processes, as well as to invest in creative leadership thinking to solve problems and make decisions that reduce the likelihood of crises (Ahmad et al., 2021a, b, c; Al Naqbia et al., 2020; Alshurideh et al., 2020a; Harahsheh et al., 2021; Kahwagi, 2015; Shah et al., 2021).

Several studies have dealt with the topic of creative leadership and crisis management, such as the study of Hamdi (2018), Al-Dhuhouri et al. (2020), Alameeri et al. (1261), AlShehhi et al. (2020), Madi Odeh et al. (2021), Allozi et al. (2021), which aimed to identify the impact of creative leadership on crisis management in Jordanian telecommunications companies. The study variables included (problem-solving and decision-making, changeability, initiative, and risk-taking, ability to communicate and motivate creativity) (Naqvi et al., 2021; Shah et al., 2020). The findings of the study revealed an impact of creative leadership on the employees' crisis management. The study recommended stimulating employees who can innovate and be creative in Jordanian telecom companies.

Also, (Abu Zaytoun, 2015) cited that the employees in the Jordanian Civil Defense Directorates in the North Region possess a highly creative leadership, in his study that aimed to identify the role of creative leadership in crisis and disaster management in the Jordanian Civil Defense Directorates in the North Region. It also revealed a statistically significant relationship between the Innovative leadership dimensions and indicators of crisis management.

According to Sohmen (2015), Al-Salami, 2012, Shakhour et al., 2021), creative leadership comprises the leader's ability to bring about managerial style growth;

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Working by activating and utilizing current technologies that are appropriate for the educational environment, conforming to modern era language, and satisfying the demands of the beneficiaries (Al Kurdi et al., 2020a, b; Al-Hamad et al., 2021; Alshamsi et al., 2020; Alsharari & Alshurideh, 2020; Alshurideh et al., 2020, 2019a, b; Bettayeb et al., 2020; Leo et al., 2021). They also emphasized the leader's ability to use innovative work methods for change and improvement, as well as qualitative and quantitative development in the workplace; to solve problems, improve the workplace environment, serve the requirements of subordinates, and influence others (Al Kurdi et al., 2020c; Alshurideh et al., 2019b; Kurdi et al., 2020; Zu'bi et al., 2012). In addition to good manners in dealing with employees, motivating them, and investing their talents and mental abilities in achieving the goals of the organization.

Other scholars add that creative leadership is the idea or suggestion that contributes to increasing the productivity of the organization (Abbas, 2015; Al-Abdullah et al., 2019; Peterson et al., 2015; Shawish & F, 2018).

Al-Hayyaf (2015) proposed a program to develop the administrative performance of department heads in education departments in northern Saudi Arabia in light of their training needs. The results of the study indicated that the training needs of administrative performance of department heads in education departments in northern Saudi Arabia came to a high degree.

While in a study aimed at building a training program in creative leadership for deans of faculties and heads of departments in Jordanian universities in the light of reality and contemporary administrative trend, (Tawiqat, 2007) results revealed that the degree of availability of creative leadership characteristics in the respondents was generally medium. Based on this, a training program in creative leadership was designed for deans of faculties and heads of departments.

Some believe that educational institutions, especially universities, must work to reduce the severity and risks of crises and support creative leadership (Al-Hussein, 2018; Al-Mashaqbeh, 2018; Battah, 2016; Hamdouneh, 2012; Maqableh, 2019) by developing targeted plans that help to address these crises based on the capabilities, as well as the material and human resources that make up effective forces that work and participate in the plans' implementation so that they operate as an immune shield against crises.

It should be noted that, in terms of crisis management, the majority of studies conducted on university education in the Kingdom of Saudi Arabia recommended the establishment of a crisis management unit in university administration to predict the foreseeable future in terms of crises and plan to avoid the risks and effects that they entail.

1.1 Problem Statement

All sectors, including the academic sector, faced an urgent global crisis represented by the outbreak of the Corona pandemic. In fact, the world is still trying to control the consequences of this crisis and plan to reduce its risks, which affected all fields.

Regarding education fields, this crisis led to the closure of schools and to shift to distance learning, and its spread also resulted in governments taking preventive measures that had social and economic consequences. Among the most prominent negative consequences of this crisis are the cessation of learning, the unwillingness of parents for distance learning, the unequal access to educational platforms, the high economic cost, the high dropout rate, and social isolation (Obeidat et al., 2004) which was confirmed by the study of Nairokh (2020) as the results demonstrated the need to prepare for crisis management beforehand through future planning and support the capabilities of the unique faculty members to prevent its occurrence or mitigate its effects. Within the limits of the researchers' knowledge, there are no previous studies on the subject of the current study. Furthermore, the current study is one of several recent studies that have addressed an ongoing crisis.

1.2 Study Questions

The study seeks to answer the following questions:

1. What is the degree of creative leadership practice in crisis management among faculty members at IAU, concerning (originality, flexibility, problem-solving, fluency) from the point of view of department heads, in light of the Corona pandemic?
2. What is the degree of creative leadership practice in crisis management among faculty members at IAU, about (escape, confrontation, cooperation, containment) from the point of view of department heads, in light of the Corona pandemic?

1.3 Study Objectives

The study aimed to achieve the following main goals: To reveal the relation between the practice of creative leadership style and crisis management among faculty members at IAU, from the heads of academic departments' viewpoint in the light of the Corona pandemic.

1.4 The Importance of the Study

The importance of this study is stemmed from the significance of the topic it deals with. The results of the current study may add scientific facts regarding the relation between creative leadership and crisis management in educational institutions. Moreover, the results of this study may benefit faculty members in identifying the creative traits that could be practiced effectively during crises that could afflict or befall academic institutions.

1.5 The Study Limits

This study was limited to an attempt to conclude the relationship between creative leadership and crisis management among faculty members at Imam Abdul Rahman bin Faisal University from the point of view of department heads, during the second semester of the year 1442/1443.

1.6 Study Procedural Terminology

Creative leadership indicates the faculty members' ability to accomplish desired changes to overcome crises by engaging in decision-making and driving solution creation to attain excellence in goal implementation.

*Crisis Management i*medicates what the university's academic leadership and faculty members do in response to present and future crises, following particular preventive measures.

2 Methods and Procedures

2.1 Study Approach

The correlative descriptive approach was used in this study as it helps in studying the phenomenon or research problem and describing it scientifically, to reach logical explanations, which gives the researcher the ability to define the frameworks of the research problem and helps in deducing the research results.

2.2 Population and Sample

The study population consisted of all department heads at Imam Abdul Rahman bin Faisal University in 2020/2021. The study population was chosen from department heads because they are the backbone of the educational process, especially in the field of creative leadership and crisis management. Where the study sample consisted of 100 department heads, (80 males and 20 females), who were chosen through a simple random method from the study population.

2.3 Study Instrument

The researchers benefited from the theoretical literature and previous studies to design a questionnaire including two main axes to meet the study's goals. The questionnaire was composed of two sub-axes: the first axis was for measuring creative leadership, it included (24) items distributed over four domains: originality (7) statements, flexibility (5) statements, problem-solving (5) statements, fluency (7) statements. Where the second axis was concerned with crisis management, including (30) items distributed into four areas: the escape method (8) statements, the confrontation method (7) statements, the cooperation method (7) statements, The fourth area is the manner of containment (8) statements.

2.4 Instrument Validity and Reliability

To check the instrument validity, the correlation coefficients of the scale items with the domain to which it belongs were extracted. The scale items were also analyzed, and the correlation coefficient of each item was calculated. Cronbach's alpha reliability coefficient was applied to check the instrument reliability through the Likert scale. The reliability value of the creative leadership axis was (0.950) which indicates a very high degree of reliability. And the reliability value of the crisis management axis was (0.940) which also indicates a very high degree of reliability.

2.5 Procedures

1. Reviewing the literature on the subject, and previous studies.
2. Preparing the study tool as explained previously.
3. The questionnaire was examined by specialists and modified until it reached the final form.
4. The researchers selected the faculty members using the simple random method from the different faculties of the university.
5. Applying the questionnaire to faculty members in the second semester of the academic year 2020/2021,
6. Entering the questionnaire data into special tables for statistical analysis.
7. Extracting the results of the study and linking them with previous studies to answer the study questions.

2.6 Statistical Analysis

The Statistical Package for Social Sciences (SPSS) program was employed to analyze the data according to the study problem and its questions. The researchers used statistical methods, including arithmetic mean, standard deviation, and one-way analysis of variance (ANOVA).

3 Results and Discussion

3.1 Results of the First Question

'What *is the degree of creative leadership practice in crisis management among faculty members at IAU, concerning (originality, flexibility, problem-solving, fluency) from the point of view of department heads, in light of the Corona pandemic?*' Descriptive analysis was used to answer this question, including computing the mean, standard deviation, degree of consistency, and order, for each of the sub-domains of the creative leadership, and the overall axis as shown in Table 1.

Table 1 shows that the degree of faculty members' practice of creative leadership was high, where the mean of their responses on this axis was (3.65), with a standard deviation (0.85) and a (high) degree. The means of the responses of the faculty members on the sub-domains of the axis ranged between (3.58–3.67). The researchers attribute these findings to the faculty members' possession of the scientific and practical skills that qualify them to be creative in the field of academic leadership, and they also attribute this to their benefiting from the academic development provided to them in this area and to the academic freedom that allows them to be creative in the academically. These results are consistent with what was revealed by Al-Hussein (2018) study, which showed that the primary school leaders in the Hawtah Bani Tamim governorate practice all creative leadership processes, while it differed from the results of the study of Maqableh (2019).

Table 1 The degree of creative leadership practice among faculty members at the university ranked in descending order

Field	Mean	Standard deviation	Degree	Rank
Fluency	3.67	0.93	High	1
Flexibility	3.60	0.87	High	2
Originality	3.61	0.88	High	3
Problem solving	3.58	0.90	High	4
Creative leadership	3.65	0.85	High	

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Table 2 The degree to which faculty members practice crisis management

Field	Mean	Standard deviation	Degree	Rank
Containment	3.77	0.86	High	1
Cooperation	3.75	0.90	High	2
Confrontation	3.69	0.85	High	3
Escape	3.45	0.71	High	4
Crisis management	3.69	0.77	High	

3.2 Results of the Second Question

'*What is the degree of creative leadership practice in crisis management among faculty members at IAU, about (escape, confrontation, cooperation, containment) from the point of view of department heads, in light of the Corona pandemic?'* Descriptive analysis was used to answer this question, including calculating the mean, standard deviation, degree of consistency, and items rank, for each of the sub-domains of the crisis management axis, and the overall axis as shown in Table 2.

The practice of the faculty members in crisis management came to a high degree, as the mean of their total responses on this axis was (3.69) with a (high) degree, and the standard deviation was (0.77). Where the means of the responses of the faculty members ranged between (3.77–3.45). These results can be explained by the fact that the faculty members are aware of the academic crises that the university may face during the Corona pandemic, emergencies, and various problems that necessitate preparing for it and preparing the available resources. In addition to the respondents' and society's perceptions of the crisis's threats and the necessity to provide the requisite capacities to deal with them appropriately when they occur. The findings coincide with the results of Hamdouneh (2012), Al-Mashaqbeh (2018), Almazrouei et al. (2020), which revealed that school principals practice crisis management skills to a high degree, and they are also consistent with the study of Al-Khamees and Al-Salihi (2019), which showed that the application of secondary school leaders to decisions concerning managing school crises was high.

4 Recommendations

Considering the findings, the researchers recommend the following:

1. Holding training and development workshops for university faculty members that emphasize the importance of creative leadership and how it can improve members' abilities to manage and face crises.
2. Creating a system of incentives and rewards to encourage creative leadership among university faculty members and to establish a culture of innovation.

3. Developing educational technology, communication, and informatics infrastructure at universities to improve creative leadership and raise the likelihood of success in dealing with academic crises.

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The Effect of Transformational Leadership Toward Organizational Innovation: A Study of Aerospace Manufacturing Industry in Malaysia

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Abstract This study objectives are to enhance the understanding of relationship between the transformational leadership on organizational innovation. This framework is proposing to identify the transformational leadership influencing effect in the organizational innovation. A sample of 120 respondent from one of the established Aero Composites Company at Malaysia participated in this research. The result of the study is expected positive support relationship between transformational leadership and organizational innovation. The result of the transformational leadership not only give a significant impact to the process innovation within the organization but in the same time the sustainability of the innovation in driven the better organization management in the competitive market. Only three transformational leadership is considered in the research project which is idealized influence, inspirational motivation, and individualized consideration in the context of aero composites industries generally. This quantitative study used SPSS method for the statistical analysis measurement.

Keywords Transformational leadership · Organizational innovation · Idealized influence · Inspirational motivation · Intellectual simulation

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_84

1 Introduction

In the era of dynamic environment with the high demand for new products and amenities almost company in the world are facing the tremendously pressure on sustaining the product, services, competitiveness in the market faced by rapid technology change, shortening product cycle life and globalization itself. The new borderless environment are created enforcement to leader become creative in managing the organization for sustainability, competing and growth the company in a good manner (Mumford & Gustafson, 1988). Innovation through creativity is essential for the success and competitive advantage of organizations as well as for strong markets leader in these new century.

Thus, this situation need creativity and innovation in leadership style (Shin & Zhou, 2003). This passion also facing at aero composite industry since the main player are limited to technology dependency and extensive research and development. Internal and external factor like COVID-19 pandemic also make contribution in today leadership style in managing crisis with digital transformation platform, spirit of changes and comprehensive financial analysis in managing the operation. Current situation shows the demand from aviation industry declining and give a tremendously pressure in the aero composites industries. The decreasing number of flights up to 20% from the world airlines give a big impact to the entire supply chain. In this case, the aero composite company are not excluding from this impact. The reduction of demand almost 40% from MYR945 to MYR540 million by the end of financial year 2020 need to be restrained to ensure the business sustainability. Even the future still uncertain the trend of world Passenger Load Factor (PLF) for commercial aircraft are increasing over the time as per (Fig. 1).

The increasing demand with the limited resource needs to mitigate, in managing these challenges, leader must be strategizing and clear direction to drive the organization sustainability. The unstable and complex future lead the aero composited industries into consideration of fracturing backlog of delivery to customer especially Airbus as a main player in commercial aircraft passenger industries. With the fragile

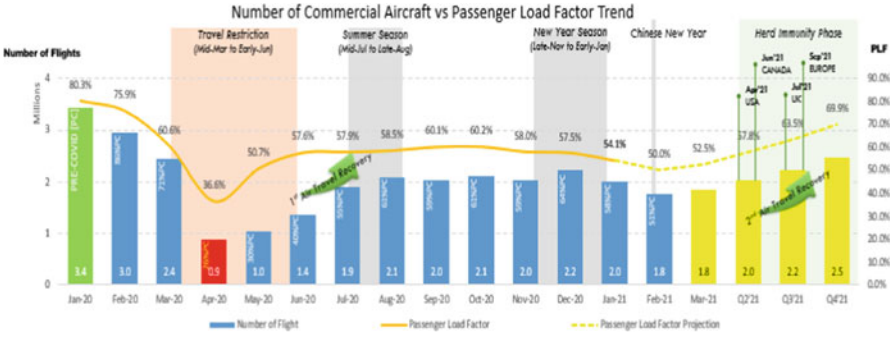

Fig. 1 Commercial aircraft demand and passenger load factor trend (PLF). *Source* (Airbus, 2021)

manufacturing environment, the recovery phases must be handled in a proper manner to make sure the customer need are materialized. The transformational leadership one of leadership style are proven can bring new ideas and possibilities into reality (Bass, 1985). Then, the organizational innovation aims to improve business outcomes by enhancing the current services, process or product to be success in the market (Scott & Bruce, 1994). It is also important for companies to constantly evolve in order to remain sustainable in the face of growing competition from businesses. However, further analysis about the connection between organizational innovation and transformational leadership are essential (Avolio et al., 1999). The strong literature influence and optimistic result of transformational leadership combined with the organizational innovation capability to respond on the demands in the changing of corporate world to makes sure this transformational leadership an attractive strategized in the future. Thus, this research hopefully can contribute additional understanding to the current literature on transformational leadership influencing to organizational innovation especially in the context of aero composite company in Malaysia.

2 Background

The new economic environment and the increasing demand from customer for varieties of product landscapes, services and quality are challenge the companies facing. This situation changes the way of respond and functionary of leadership. An innovation effort is required for organization to stay competitive in the industry. A part of that, organization need effective leaders to change the people. In order to manage the complex pressure, the leader need to come out the best strategies in ensuring business sustainability. The function of leadership as to determinant of organizational inspiration and innovation. This responsible become more important with the growing complexity of job and processes competitiveness in the market. The attribution of innovation as central to competitiveness has been driven by the technological advancement, emergence knowledge economy, competitive element and reliable service in the market. In fact, organizational innovation are more important than before in organization for survival, growth, competing, and remain relevant in the industry (Avolio et al., 1999). Thus, this required an organization to become innovative to gain and survive.

Transformational leadership is knowing as a major determinant of innovation. It can be defined as some or leader share vision and goal inspiring followers in an organization or unit. The leader functional as to challenge the sub accessor to become innovative, problem solver and develop the capability of follower to become a leader by talent development by coaching, mentoring, and providing the challenges and support in materializing the strategic overview (Bass, 1995). In others perceptive, leadership also involves communication among more than one member of a group that regularly engage in managing the situations, perceptions, and expectations of team members.

Innovation can be expressed as an execution of a concept, new item, service, process, marketing strategy, and organizational method. Organizational innovation is essential to current complex organization, this method result from the strategic decision that management has taken. In others words organizational innovation was define as the tendency of an organization or people to changes in developing a new product, services, process and improve it to the new level with its impact on economic development (Gumusluoglu & Ilsev, 2009). Moving forward, the organization must have unique approach to attract their customer, an innovation can play a significant role in this development model. Innovation must be adopted individually and in organizational level to succeed (Jung et al., 2003). Over the years, researchers explored the significant of leadership in influence organizational innovation and identified the related characteristics that significantly affect the organizational innovation (Shin, 1996). Previous studies recommend that transformational leadership has a resilient correlation with innovation both at the organizational level than the individual level (Rosing et al., 2011). Leader are key important roles towards the efficiency of organizational innovation by influencing secure strategic decisions, procedure and policies that are functional as change agent in supporting innovation (Prasad & Junni, 2016). Thus, the right type of leadership are important in driving the effectiveness of organizational innovation (Oke et al., 2009).

Among the empirical study the transformational leadership are most suitable leadership types to enhance the ability of group or organization to change in innovative and creative way in developing the new designs of solutions, organizational structures changes, processes improvement, system practicality and efficiency (Prasad & Junni, 2016).

This study attempts to magnify the understanding of transformational leadership influence of transformational leadership on organizational innovation through resource supply. There are requirement on additional empirical study to support the theoretical proposal analysis on the relationship between transformational leadership and organizational innovation especially on the mediating and mediator variable or determinant need to be examine systematically (Jaskyte, 2004). According to Choi et al. (2016), previous study findings indicate that further research is needed to explicitly focus on the relationship between transformational leadership and organizational innovation, include the limited factor to successes this both relationship. As a finding of previous studies on leadership and innovation have a many opinions and constraint and not drive a simple decision and come out with variation of result and findings. While different leadership styles are positively related to innovation, but most of study show a wide range of correlations based on the setup of moderating conditions. This are lead to arguments that the relationship between transformational leadership and organizational innovation are not always same understanding, which drive for discovering mediating and moderating variable between the theory in detail (Choi et al., 2016). The other studies also suggest, a leader with a transformational leadership style should focus on many areas of the innovation process, such as an overall supportive environment to enhance leader influences. This supportive environment is regarded as an organization's supporting contribution to its employees in order to increase engagement and improve performance (Choi et al., 2016). As a

result, through supporting processes inside the organization, it can encourage people to give their time and efforts to innovation initiatives (Amabile, 1998). Therefore, transformational leadership has a substantial positive relationship with organizational innovation, both directly and indirectly through the level of the organization's climate for innovation. Empirical study highlighted the importance of expanding and refining the measurement of organizational innovation because the variables in the study used need to be quantity in materializing organizational innovation were inadequate enough in generating the success outcomes (Gumusluoglu & Ilsev, 2009a). Hence enhancing this research has an significant contribution to understanding and more practicality systematic approach of the relationship between transformational leadership and organizational innovation (Jong & Hartog, 2007), in aero composites industries generally.

3 Literature Review

3.1 Organizational Innovation

Organizational innovation are refer to tendency or the organization to developed a new product or product improvement either in term of competitive price, good services and the successful in bringing value added products or services to the market (Gumusluoglu & Ilsev, 2009a).

It can be defined as the organizational capability to revamp ideas and understanding into new products, services or processes constantly for the benefit to the organization. Accordingly to the empirical research mention creativity as the production of inspired, valuable ideas, and innovation as the successful reality of innovative ideas neither in the group or organization, from the variance of study several researchers have rather defined organization innovation in concurrence with the individual creativity and recognizing individuals talent are the ultimate underpinning of new improvement (Shalley et al., 2004).

3.2 Transformational Leadership

There has innumerable definition of leader by different researcher in various aspect. According to empirical study leadership can be define as the process of providing a significant track or determination for collective exertion, encouraging and willingness to commitment in materializing the target. Based on previous research transformational leaders have been identified give an influence on innovation, which are the ability leader enhance the tendency to innovate within the corporate organization. Normally the transformational leader use inspirational motivation and intellectual

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simulation which are the most critical factor in influencing organizational innovation (Elkins & Keller, 2003). Transformational leadership style are proven effective through the managerial level (Howell & Avolio, 1993), working environment (Bass, 1985), national culture (Jung & Avolio, 2000), computer related setting (Sosik et al., 1998), innovative developmental environment (Howell & Avolio, 1993), and TQM programs (Sosik & Doinne, 1997). The transformational leadership characteristic are answer to the competitive business environment adaptive leadership is considered to be an important tool (Bass et al., 2003). These adaptive leadership behaviours are characterized as transformational leadership. The four component consist of idealized influence, inspirational motivation, individualized consideration, and intellectual stimulation (Bass et al., 2003). In this research only three main components are considered which are, idealize influence (II), inspirational motivation (IM), and intellectual simulation (IS).

3.3 Idealize Influence

Idealized influence is referred to the type of leader with trusted and well respect behaviour by the follower in the organization or group of people. Typically, this type of leader is stimulus to take a new risk and frequently show the act as role model. Another named of this type of leadership are known as known a charismatic. This type of leader is highly regarded on the moral and ethical value. Previous study showed the effect of transformational leadership characteristic among supporter's shows most of the enthusiast are able to take possibility risk after being organizing with transformational leaders. The confident personality and self-efficacy of such leaders in turn affect how the groups feel about their own capabilities (Bass & Riggio, 2006).

Even the idealized influence are was considered as the most important dominant component of transformational leadership style but this component does not be enough to measure the understanding of transformational leadership (Bass, 1995) individually.

3.4 Inspirational Motivation

Inspirational motivation main characteristic are including enunciating a convincing vision, articulating confidence in accomplishing goals, talking positively and passion about the future along with the desires to be accomplished (Jung & Avolio, 2000).

The functional of inspirational motivation are to enhancing and improve team understanding with the organization vision and mission. This technique will lead to increase group member or organization initiatives and awareness to perform beyond

the expectations. The supported levels of motivation is linked towards the higher levels of performance which likely to enhance organizational innovation (Shamir et al., 1993). In these technique leaders encounter followers in reminiscent ways and demonstrate commitment in attaining goals and shared visions. Apart from being consistently included in inspirational motivation in transformational leadership, the establishment of organizational vision and mission is also stated to have relationship in promoting organizational innovation.

As the previous article cited, the successful organization improvement are dependent on the preparation of the followers to achieve the vision through implementation change element, expressing optimism characteristic, confidence and passionate (Jung & Avolio, 2000).

3.5 Intellectual Simulation

An intellectual stimulation is define as a cause's emotion encouragement behaviour among resilient followers. These technique inspire the followers to be innovative and creative in handling problem solution, handling new challenges, and promoting the new way of thinking as a change agent (Jung & Avolio, 2000).

Intellectual stimulation refers to leader who are promotes the intelligence technique, knowledge and learning in developing innovation and solution in problem solving behaviour in materializing the organization improvement planning. These leaders will display environmental awareness and recognize innovation opportunities through cautious evaluation of environment impact (Conger & Kanungo, 1988). According to Woodman et al. (1993), the leader as a founder of different planning and own the obligation on the project by comprehensive strategic planning. At the same time react as inventors and visionaries who inspire team or group of people. The creation of competitive new products within an organization framework is the results of organizational innovation. Commonly, transformational leadership are related to a higher level of performance (Woodman et al., 1993). Transformational leadership have positive impact on employee performance in group and organization (Sosik et al., 1998).

Meanwhile at previous research study have confidence in transformational leadership influences the organizational innovation creatively, these also support by research on actuality and nature of this relationship (Mumford et al., 2002). Finally, the team factor such as intellectual simulation behaviour also influenced by transformational leadership (Waldman & Atwater, 1994).

3.6 Relationship Between Transformational Leadership and Organizational Innovation

From the selected previous research, transformational leadership can be define as the process of providing a significant track or determination for collective exertion, encouraging and willingness to commitment in materializing the target (Avolio et al., 1999).

Transformational leadership are recommended have significant impact in organizational innovation process by using the four element behaviour (Bass, 1995), in this study consideration which are:

1. Idealize Influence (II)—focus on leader charismatic action on value, mission, vision and belief.
2. Inspirational Motivation (IM)—the technique of the leader to gain up the follower in belief on future growth and determinant goal.
3. Intellectual Stimulation (IS)—refer to how the leader challenge their follower in materializing the improvement and creative thinking and solution will be implemented.

While the organizational innovation can be define as the organizational capability to improve the new idea and information in to a new product services or process enhancement continuously give beneficial to the firm (Gumusluoglu & Ilsev, 2009a) and tendency of organization to improve, develop, and sustain the product, process or services to the market (Damanpour, 1991). To relate the transformational leadership with organizational innovation the previous research shows the leadership style will affect the organizational tendency to innovate (Gumusluoglu & Ilsev, 2009a) and in the same time will drive the result beyond expectation by enhancing level of self-confident and motivation (Mumford, 2002). Thus the direct and indirect impact of transformational leadership have correlation to organizational innovation and drive the positive and significant relationship between the two constructions (Gumusluoglu & Ilsev, 2009a). Thus, the various definition of transformational leadership and organization innovation are shows at (Table 1) as summary of the various section overview.

The selection of variable for this research are:

1. Variable 1—Transformational Leadership (IV)
   Transformational leadership style is being used as independent variable (IV) in this research.
2. Variable 2—Organizational Innovation (DV)
   Organizational innovation process is being used as dependent variable (DV) in this research.

Previous empirical case study is had been used to understand the conceptual of the research as per below justification.

Study Title: Transformational leadership and organizational innovation: Moderated by organizational size.

Table 1 Various definitions of transformational leadership and organizational innovation

Definition	Source
The technique decision making units are structured within the organization, the way decision making, power, and skills are distributed within the organization and between decision making elements and the type of information and communication structures that are well organized	Greenan (2003)
Organizational innovation is the introduction of new organizational systems of work and collaboration	Mulej (2002)
Managerial innovations occur in the social system of an organization. It includes rules, characters, procedures and structures that are related to the communication and discussion among people and environment	Damanpour (1991)
Transformational leadership emerged to be effective across managerial levels	Howell and Avolio (1993)
Process of providing a significant track or determination for collective exertion, encouraging and willingness to commitment in materializing the target	Bass (1995)
The special characteristic of organizational innovation can be obtain as it's bring the change to the firm social system, while the change might be not technical and intangible but in the same time it might affect the technical aspects as well	Edquist et al. (2001)
The words of organizational innovation itself in general are applied by the organization by adapting the changing conditions of competition, technical innovation and business growth through introducing better products, techniques and systems	Utterback (1994)
The leader functional as to challenge the sub accessor to become innovative, problem solver and develop the capability of follower to become a leader by talent development via coaching, mentoring, and provision of both challenge and support in materializing the strategic overview	Bass (1985)
Transformation leader are able to bring change in their follower personal normal and encourage the organization performance beyond the expectation at the same time increased the level of motivation similarly with self-motivation	Jung and Avolio (2000)
Organizational innovation can be defined as the organizational capability to improve the new idea and information into a new product services or process enhancement continuously give beneficial to the firm	Bass (1995)

4 Summary

This case study emphasizes on the impact of transformational leadership on organizational innovation. A sample of 296 managers are used from the telecommunication sector at Pakistan. The average ages of participant used within 25 to 60 years.

Hierarchical regression models are used to demonstrate organizational size significantly moderating the relationship between transformational leadership. This study proof that organizational population size is moderated significantly the relationship between all aspects of transformational leadership and shows the positive impact with organizational innovation.

Keywords: Organizational innovation, transformational leadership, attribute charisma, organizational size, inspirational motivation, intellectual stimulation and individualized consideration, idealized influence (Khan et al., 2019).

Based on study model the construction of hypothesis development for this research are:

1. Hypothesis One—Idealize Influence
   H01—Idealized influences is not related to organizational innovation at Aero Composites Company.
   H1—Idealized influences is positively related to organizational innovation at Aero Composites Company.
2. Hypothesis Two—Inspirational Motivation
   H02—Inspirational motivation is not related to organizational innovation at Aero Composites Company.
   H2—Inspirational motivation is positively related to organizational innovation at Aero Composites Company.
3. Hypothesis Three—Intellectual Simulation
   H03—Intellectual simulation is not related to organizational innovation at Aero Composites Company.
   H3—Intellectual simulation is positively related to organizational innovation at Aero Composites Company.

5 Theoretical Framework

The dependent variable (DV) for this study is refer to the Contingency Theory (CT) initiated by "The work of Weber" (1947). Under the scope of contingency theory, the most suitable structure for an organization is the one that best matches a particular operational contingency, such as size of operation (Pugh et al., 1969), technology (Woodward, 1965) or environment. This theory underpins the knowledge of the interactions between nature, technology, environment, structure, and performance (Burns & Stalker, 1961). The demonstrated of differentiate technology and market environment in the perspective of rate of change and complexity will affect the organizational structure and innovation are shown in the (Box 1) (Burns & Stalker, 1961).

Box 1 Mechanistic and Organic Structures. *Source* Burns and Stalker (1961)

Bums and Stalker (1961) set out to explore whether differences in the technological and market environments affect the structure and management processes in firms. They investigated twenty manufacturing films in depth, and classified environments into 'stable and predictable' and 'unstable and unpredictable'. They found that firms could be grouped into one of the Wo main types, mechanistic and organic forms, with management practices and structures that Rums and Stalker considered to be logical responses lo environmental conditions.

The *Mechanistic Organization* has a more rigid structure and is typically found where the environment is stable and predictable. Its characteristics are:

(a) tasks required by the organization arc broken down into specialised, functionally differentiated duties and individual tasks arc pursued in an abstract way, that is more or less distinct from the organization as a whole;
(b) the precise definition of rights, obligations and technical methods is attached to roles, and these arc translated into the responsibilities of a functional position, and there is a hierarchical structure of control, authority and communication;
(c) Knowledge of the whole organization is located exclusively at the top of the hierarchy, with greater importance and prestige being attached to internal and local knowledge, experience and skill rather than that which is general lo the whole organization;
(d) a tendency for interactions between members of the organization to be vertical, i.e. between superior and subordinate.

The Organic Organization has a much more fluid set of arrangements and is art appropriate form to changing environmental conditions which require emergent and innovative responses Its characteristics are:

(a) individuals contribute to the common task of the organization and there is continual adjustment and re-definition of individual tasks through interaction with others;
(b) the spread of commitment to the organization beyond any technical definition, a network structure of control authority and communication, and the direction of communication is lateral rather vertical;
(c) knowledge may be located anywhere in the network, with this ad hoc location becoming the centre of authority and communication;
(d) importance and prestige attach lo affiliations and expertise valid in industrial and technical and commercial milieu external to the firm.

Mechanistic and organic forms are polar types at the opposite ends of a continuum and. in some organizations, a mixture of both types could be found.

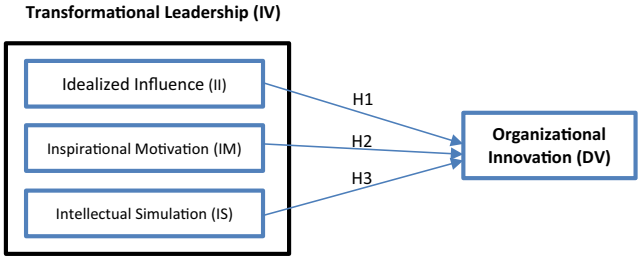

Fig. 2 Research conceptual framework

Discussing on theory of the study, the research framework is develop to demonstrate the relationship between the external determinant and internal determinant in transformational leadership style as the independent variable (IV) with the organizational innovation as dependent variable (DV) as per (Fig. 2).

6 Research Methodology

This research design used quantitative approach to support the hypothesis. The questionnaire will be used to pertaining the leadership style and to excess the full range of leadership scale, the influence factor and the relation with organizational innovation. The study will use data measurement Likert Scale. The scale weightage used logic numbers 1 through 5 with the format indicate (Armstrong, & Robert, 1987). The collection data by conducting an internet web survey trough SPSS application will be presenting the descriptive analysis which provide simple summaries about the sample and the measures. The analysis result will be present using simple graphics analysis in the basis of virtual. Every quantitative analysis of data as part of data analysis and measurement.

7 Conclusion

The ability to continuously innovate by implementing creative efforts as well as the necessary skills and attitudes is critical to an organization's competitiveness. Leadership become major determinant of an organization ability to innovate, with its significant impact on the creation of the organizational vision and the methods to achieve the goal, the benefits of transformational leadership in stimulating organizational innovation can be secure by organizational in the context that support innovation and increased the overall performance of the organization.

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Entrepreneurial Marketing: An Approach-Based Paradigm Shift to Marketing

Hanin Damer, Shafig Al-Haddad, Ra'ed Masa'deh, and Muhammad Turki Alshurideh

Abstract This paper aims to augment the research field of Entrepreneurial Marketing (EM) as a concept and approach, and the substantial differences it holds in comparison to the prevailing giving of the marketing. In doing so, the research aims to explore and analyze the causes and drivers that resulted in the emergence of EM as a new school of thought and conceptualize the paradigm shift EM is providing to the prevailing giving of the marketing field. Grounded theory and logical argumentation based on the literature review including both qualitative and quantitative research, to develop the argument leading to conceptualizing the proposed approach-based paradigm. The research conceptualizes a proposed paradigm to formalized marketing with four main components comprising it: resilient management; scalable/gradual matter of sub-frames including multi-dimensional orientation effectual-causal, proactiveness-reactiveness; living strategic process, and Entrepreneurial Innovation. This paper represents the first bold proposal on the need for a paradigm shift to the prevailing marketing giving and introduces a frame for conceptualized paradigm. Specifically, does the body of literature in EM provide a base toward a paradigm shift of the prevailing of marketing giving or only a new school of thought?

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_85

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Keywords Entrepreneurial marketing · Termed-labeled marketing · The paradigm shift

1 Introduction

Research in entrepreneurial marketing has developed since its inception involving the number of views, lenses, perspectives, theories and models. That aim at defining, investigating, understanding and even measuring and assessing validity and impact. And this holds the main themes of viewing EM. Along with this growth in research comes the notice of labeled or termed marketing, with the adjectives attached to marketing including "conventional", "conventional wisdom", "traditional", "standard", "administrative", "textbook marketing", "corporate traditional marketing" and others. Mostly in the context of explaining the difference between EM and labeled marketing, in addition to other notices on the critique side concerning being no longer suitable to address the changing of the business, economic and market landscape. This labeling of marketing is the result of the emergence of new definitions or models that differs noticeably from the giving of the formalized marketing discipline and curricula. And that proved to be more suitable in the current market landscape. The discipline is still there, but the approach to these elements developed noticeably with applied models differing from the current giving's. While "Marketing" remains as a discipline, this discipline had witnessed development until shaping the formalized principles and theoretical frames deriving the giving of the main textbooks. And it shall also be subject to continual development with the advancement and changes requiring a response. Moreover, research indicates a lag between this discipline as a research body and academia and the business and practice world, which raises the need for such evolvement rather than development.

This paper augments both the research in EM and critique to the formalized marketing to propose the concept of an approach-based paradigm shift in marketing. Arguing that this provides a basis and a call for a paradigm shift, which shifts the approach and concept interpretation providing a frame that, responds to the changes shaping the market, business and economy. In proposing so, this paper also aims to investigate the main drivers behind in link with those addressed in EM; environmental landscape, mindset, activities, resources landscape, etc. Noticing that all stress the need for a novel approach.

Although vast researches on EM indicates the insufficiency of the formalized market giving's to the Entrepreneurial Ventures (EV), SMEs and also on the general level with the changing in business and market landscape, none augmented on the body available to promote it concerning paradigm shift. Some tended to indicate the need for a new school of marketing thought (Abu Zayyad et al., 2021; Al-Dmour et al., 2020; Mort et al., 2012). Under this paper, we refer to the existing prevailing course of marketing as formalized market giving's indicating the standards, we refer to also to avoid muddling with terms used in labeling marketing in the reviewed papers. This covers the "marketing activities of planning, formal marketing research, design and

implementation of the marketing mix or program, that are the core of the traditional textbooks in marketing" including Brassington & Pettitt, Jobber and Kotler et al. as indicated in Amjad et al. (2020a), Alwan and Alshurideh (2022).

Still, marketing is evidenced to be a key to the success of new ventures (Mort et al., 2012; Al Kurdi et al., 1339). Furthermore (Miles & Darroch, 2006) argues that EMP could be leveraged in large firms as equal to SMEs to establish a sustainable competitive advantage. Especially in the context of dramatic changes on social and technological bases, where EM is seen as an approach toward establishing sustained customer relationships (Miles & Darroch, 2006).

2 Entrepreneurship and Marketing

This paper does not aim to provide a literature review for the two disciplines of Entrepreneurship and Marketing, however, below aims to review key definitions and concepts on these two disciplines. To establish the base for the argument and augmentation on research.

2.1 Entrepreneurship

The core focus of this paper is entrepreneurship in the business field. Moreover, this provides the base required, with the review of literature linked to it covering behavioral and activity perspectives of entrepreneurship. Thus, starting by the entrepreneur definition as proposed by Drucker as cited in, defining an entrepreneur from a behavioral and activity-based perspective as the person who looks for the change, but differs in being responding to the change in an innovative way, thus utilizing it as an opportunity (Alameeri et al., 2021; Mehmood et al., 2019; Stokes, 2000). Building on Drucker's ideas entrepreneur is defined from the process viewpoint as "a process, an action-oriented management style which takes innovation and change as the focus of thinking and behaviour" (Stokes, 2000). Morrish et al. (2010) indicates a definition for an entrepreneur as "engaging in opportunity creation or discovery, assessment and exploitation of attractive opportunities" from the perspective of what the meaning of being such.

Moving to firm context, the entrepreneurial firm is defined as "one that engages in product-market innovation, undertakes somewhat risky ventures, and is first to come up with proactive innovations" (Kraus et al., 2010). Attached to this definition is entrepreneurial management defined as "the process by which individuals—either on their own or inside organizations—pursue opportunities without regard to the resources they currently control" (Kraus et al., 2010). Phua and Jones (2010) considers that entrepreneurship is better to be understood from theoretical and practical views, to help to understand what actually in practice it is. Under this view, the authors adopt the process perspective definition of EM considered by Morris et al.

(2002), where the key elements composing the process are "the entrepreneur, the opportunity, and the acquisition and management of resources".

Also from a process view, entrepreneurship is defined as "the process of creating value by bringing together a unique package of resources to exploit an opportunity." Where it entails the activities required for opportunity identification, business concept definition, assessment of required resources and acquiring them, in addition to managing and harvesting the venture (Morris et al., 2002). Moving to the concept, the entrepreneurship concept is found to have three fundamental dimensions, "innovativeness, risk-taking/management, and proactiveness" (Morris et al., 2001). The author defines concept and process perspective as "Entrepreneurship is how firms discover, create or assemble resource assortments that allow them to produce valued market offerings".

From a firm contextual frame, (Collinson & Shaw, 2001) sees that the entrepreneurship area holds relevancy for large and small size firms as well. Explaining the cause behind being attached more to SMEs to two points: commonly visible more in smaller sized firms and with firms growing in size, the complex structure of management makes it more challenging to maintain an entrepreneurial focus. The authors continue to explain, most of the research in this field is around the SME, is due to the difficulty of spotting the true entrepreneurial large firms. However, the number of large-size firms developing this approach is increasing. The author states that the number of large firms through their approach to marketing activities can be entrepreneurial.

Even though literature relates EM to SME context, (Hills & Hultman, 2011) notes the discrepancy between EM and small business marketing that is reflected in a conceptual separation between both. Attaching the difference to the behaviors of the person running the firm; owner mindset running the business as opposed to the entrepreneur mindset. The note is valid, however, in this paper, the author relates SME to the EM in the commonalities of the organization context of size, constrained resources, newness in the market and other attributes. The same extends to the references reviewed that tackle SMEs from the same perspective. In this view, we attribute to the notion "A small business is not a little big one" observation of *Welsh/White*'s (Gruber, 2004) provides an insightful piece to shift the understanding of new ventures as in comparison to larger ones. Gruber (2004) identifies three main characteristics differentiating new ventures namely: newness, small size, Uncertainty, and turbulence.

Collinson and Shaw (2001) brings another perspective of defining entrepreneurship within the context of this paper with "entrepreneurial effort" linked with "entrepreneurial scenario" encountered with a focus on firm and management context. Where "entrepreneurial effort" is described to hold several characteristics demonstrated by the entrepreneur or those of the management team, these include "energy, zeal, commitment, determination, persistence, opportunity and focus". On the other hand, the "entrepreneurial scenario" is referred to as a level of risk encountered by the firm, along with resources available in addition to the need among individuals for "skills, knowledge, experience and personal independence". The consequence of these two factors is found to be affecting the degree of firms' development

and growth over (Collinson & Shaw, 2001). This explains why with the growth marinating the same level of "entrepreneurial effort" becomes more difficult, along with this challenge comes the tendency toward activities lowering risk levels.

2.2 Marketing

Marketing is considered by several researchers as one of the crucial elements of firm success (Alshurideh, 2022; Lee et al., 2022a, 2022b; Tariq et al., 2022). Where it is also considered as one of the vital pillars for the realization of both objectives and success (Franco et al., 2014). Definitions cover both scholarly work and textbooks of academia, with different views mainly of concept and process perspectives. As overall briefed definition marketing is viewed as, "meeting needs shortly" where needs refer to human and social needs and marketing to include identification of those needs (Kotler & Keller, 2016).

The recent revision for the definition of the American Marketing Association (AMA) dated 2007 defines it as" Marketing is the activity, set of institutions, and processes for creating, communicating, delivering, and exchanging offerings that have value for customers, clients, partners, and society at large" (Hills & Hultman, 2011). Continuing on concept level definition, five components are indicated to be included in any definition of marketing, these are "two or more parties, something that is given up by each party, something that is received by each party, some level of communication between the parties, and some mechanism to perform the exchange" (Morris et al., 2001). Stokes (2000) from an organizational point of view defines four components underlying the varied definitions of marketing including an imperative one represented by organizational culture and the three of the strategic process, tactical methods, and marketing intelligence. The integration of these components suggests the comprehensive definition of marketing as an "organizational philosophy of market orientation, guided by segmentation, targeting and positioning strategies, operationalised through the marketing mix and underpinned throughout by market intelligence" (Stokes, 2000).

More specifically at the process level (Morris et al., 2001) views it as "the process of planning and executing the conception, pricing, promotion and distribution of ideas, goods and services to create exchanges that satisfy individual and organizational goals". The authors indicate also four categories of interrelated linkages that are introduced in most definitions of marketing: "product", "price", "promotion", and "distribution", these four combined results in numerous scenarios of decisions each denoted as the "Marketing Mix". The mix decisions shall be designed to reflect the needs identified of targeted customers, allowing at the same time provision of the firm with sustainably based differentiation edge as compared to competitors.

2.3 New Approaches/Recent Approaches

In searching for new methods, that are more suitable for different business environments, new marketing approaches emerged in practice and academic literature. With adjectives terming these as new approaches to the marketing, among these main are "Environmental marketing management", "Subversive marketing", "proactive marketing", "expeditionary marketing", "guerrilla marketing", "Viral marketing", "radical marketing" and "disruptive marketing", and "viral marketing" (Morris et al., 2001, 2002). Some authors consider the emergence of these as an informal rise of entrepreneurial marketing, including the new models /methods /perspectives that emerged both in the trade and in academic literature. The common factor seen among these is being concerned about an entrepreneurial role for marketing in leading-edge companies (Morris et al., 2001).

Below provides a highlight on the key aspects of the main new approaches indicated earlier to provide the understanding of the difference between this and the formalized market giving and to provide the base for the next section on Entrepreneurial marketing (Table 1).

Assessment of these indicates the commonalities briefed by Morris et al. (2001) as including efficient marketing budgets, where with constrained resources extensive amount is conducted; different modes of resource leveraging, where people in charge capable of employing resources, not under ownership or control, refusal of "conventional approaches" to marketing variable management; continuing product/service innovation; leading customers along with the capability of affecting change in the

Table 1 Explanation of new approaches/models/perspectives to marketing

Guerrilla marketing: relies on bootstrapping, creative use of available resources, and a highly targeted mix of innovative communications techniques
Radical Marketing: describe a set of approaches that they argue challenge the status quo, or immutable laws, of marketing
Expeditionary Marketing" describes the "role of marketers in creating markets ahead of competitors
Subversive marketing: refers to the need for marketers to undermine company structure and process to implement innovative marketing practices
Environmental marketing management: where marketing theory explicitly adopts a proactive, entrepreneurial orientation to the management of environmental conditions
Proactive marketing: includes ongoing responsibility for redefining the product and market context within which the firm operates, identifying novel sources of customer value, and emphasizing unproven wants, new market segments, new technologies, and continuous innovation in all areas of the marketing mix
Viral Marketing encourages individuals to pass on a marketing message to others, creating the potential for exponential growth in the message's exposure and influence
Buzz marketing is the aggregate of all communication about a certain product that is propelled through grassroots activities among people at any given time

Source Adapted from Morris et al. (2001)

environment of context. Morris et al. (2001) argues that these different approaches and perspectives, advocate the base for an "alternative concept" of marketing. Supported by the point that these emerged with the changes occurring in the market and business environment and the need for new approaches to respond, in the light of insufficiency of existing ones.

3 Entrepreneurial Marketing

3.1 Marketing Within an Entrepreneurial Context

"In each small entrepreneurial firm, marketing is done" (Gross et al., 2014). Even if not through the involvement of the entrepreneur or the team in the formal or theoretical process of it, it remains to be practiced on a day to day with the intuition, formulation and implementation (Gross et al., 2014). Stokes (2000) notes the increased recognition of the marketing as practiced by entrepreneurs to be different than those concepts offered in what is referred to as conventional marketing textbooks and give the example of Kotler. Stokes and Stokes (2000) make the note that "a small firm is not simply a scaled-down version of a large firm" clarifying that not the same rule of large firms can presumably assume to be valid for new ventures. On the other hand (Collinson & Shaw, 2001) sees that EM is also valid for a larger firm, and provides the example of Virgin.

Entrepreneurial firms are deemed to be driving markets, through influencing the marketplace directly or indirectly and supporting shaping it (Morrish, 2011). Though celebrated as far different from conventional, small business holds several difficulties when it came to marketing, such as a slim customer base, marketing activities of both limited scope and impact, efforts of unplanned and diversified nature (Stokes, 2000). Marketing is considered among the utmost challenges faced in SMEs, yet it is also of crucial importance for the survival and success of SMEs (Franco et al., 2014). Although not all entrepreneurial firms are SMEs, (Becherer et al., 2012) considers marketing to have a higher significance in the context of the size of SMEs, where one customer lost or gained has a high impact on the survival of these firms. Becherer et al. (2012) confirms the same point and considers marketing to be a primary success determinant among all new ventures. Also within the entrepreneurial context, venture capitalist rates marketing as of extreme importance (Becherer et al., 2012).

Morrish (2011) proposed that EM firms still perform the processes of traditional marketing, but in a way that is influenced profoundly by the main attributes of entrepreneurs guiding the process from the core. These attributes are innovation, reactiveness, and risk-taking. Furthermore, (Morrish, 2011) views EM firms as having a twofold core of both customer-centric, being similar to AM and entrepreneur-centric. Providing the EM firms with the flexibility of navigating Market-Oriented strategy and Entrepreneurially Oriented strategy as deemed suitable for the different environments. Morrish et al. (2010) also suggests that EM could represent one of the

evolution stages of marketing sophistication within the firm. With the possibility of occurrence at the initial or last stages, implying the EM is still considered as "fully embedded by the traditional processes of marketing management and strategy". Morrish et al. (2010) is a support to this stage model of Kotler, proposing that EM could be very effective along all the stages of the model, at any time the organization is in a need of creating or discovering new and attractive opportunities and exploiting them. In proposing so, the authors see that marketing's core functions and processes remain the same. However, the difference occurs in the approach within which where these functions and processes are conducted while adapting an approach of an "entrepreneur/customer opportunity-driven" to the three elements of marketing namely: culture/philosophy, strategy and tactics. Affecting consequently the implementation of the process of segmenting, targeting and positioning.

This view sees the difference in EM being in the influencing attributes, while the process remains the same as the referred to "traditional marketing" or formalized marketing giving's. And appears to conflict with the mainstream literature on EM viewing it as substantially different in approach, strategy and process from the formalized marketing giving's such as (Gruber, 2004; Morris et al., 2002; Stokes, 2000). It also appears to have a sort of conflict with the stage model of Kotler dated 2003 adopted by the author in their definition of EM, (Morrish et al., 2010) concludes that EM organizations "have a core of AM [Administrative Marketing] functions, augmented by the entrepreneur's desires, needs and motivations [….], nested and overlayed by the multiple layers of EM processes". In indicating EM processes, the author defines a new set of processes other than those of AM, where at the same position sees that marketing core functions and processes remain the same, with the difference in the adopted approach to these processes.

Another point is attached to the notion of EM organizations having a core of AM functions, which comes in conflict with several works indicating that this function is not available at EV in most cases (Stokes & Stokes, 2000). This conflict is better understood within the perspective adopted by Morrish et al. (2010) focusing on the interrelationship among AM and EM. In addition, not the integrative perspective. Entrepreneurial marketing is defined as "the marketing of small businesses which grows through entrepreneurship" (Yadav & Bansal, 2002). This view limits the definition to the contextual practice rather than the concept-based definition.

3.2 Theoretical Foundation and Development

Collinson and Shaw (2001) draws three main focus areas in the development of EM seen as emerging from the two management disciplines of marketing and entrepreneurship, considered traditionally as two distinct areas of study (Stokes & Stokes, 2000). After which research evolved around the overlap between both, identifying the areas of similarity and differentiation while investigating the role of each in the other and how these can benefit from each other. The interface comes as research

advances, with the focus on the attempts to combine the two disciplines and provide an integrative area (Collinson & Shaw, 2001; Stokes & Stokes, 2000).

Uslay and Teach (2009) highlights the issue raised by other scholars on the fast emergence of the MEI, with the potential of becoming a "distinct marketing school of thought". Notwithstanding this, this remains insufficiently developed with segmented works, while a single paradigm has not been developed yet. EM (2012) concludes four main different approaches that were developed along the time of researching the field of EM, these are commonalities between the two main disciplines, "entrepreneurship in marketing" focusing on marketing framework within which entrepreneurship elements are introduced; third is "marketing in entrepreneurship"; and the fourth comes in opposite to the first approach in identifying what is unique about EM rather than similarities, arguing that combination of these two disciplines yields in a new distinctive thing. Collinson and Shaw (2001) sees three key areas of interface between marketing and entrepreneurship: both being change focused; both in nature are opportunistic, and both are innovative in approaching management. Another views build on the interface role and define EM research as focusing on exploring the interfaces of three disciplines and not only the two of marketing and entrepreneurship, with the addition of Innovation. Jones and Rowley (2009). This evolvement in the approach to understanding EM provides a rational sequence of approaching this field. It also on the other hand reflects an extent an implicit evolvement in the marketing discipline too, that is affected by this evolution. The fact that EM is viewed as the first approach of studying it under the commonalities between Entrepreneurship and marketing and later as the role of it in Entrepreneurship or the other way of role relationship provided a base toward the evolvement of marketing school of thought. While if EM is considered as integrative concept from the onset this would have seen limitations.

EM (2012) indicates the first emergence of EM to be dated 1982 at a conference at the University of Illinois. Later in 1987, the first formal research convention on Entrepreneurship and marketing was held at the (AMA), turning later on to the annual event of "Research at the marketing-entrepreneurship interface conference" (Amjad et al., 2020b; Stokes & Stokes, 2000). Amjad et al. (2020b) in researching the current development is "Entrepreneurial Marketing Theory" indicates that research in the EM witnessed rapid progress over the last decade, attributed to the effectiveness of EM in the uncertain conditions and markets of high competition. Figure 1 from the same study shows the first literature on EM to be in 1976, with slow growth following; and rapid one starting from 2000, specifically from 2010. Totaling of 160 articles were examined in their study between the duration of 1976–2018, among these 140 are in the ten years between 2008–2018.

Despite the progress in the research and the rapid one as shown in Fig. 1, the EM area is considered to be still substantially lacking theoretical and academic models (Amjad et al., 2020b). The author also indicates that EM is identified as a "much under-researched area" in a vast range of the literature, with interventions and practices in this area being sprinted away ahead of the work on in the research and development of theories needed to vindicate and explain (Amjad et al., 2020b). Despite this situation, new models are developed during the progress in the research in EM. These are identified by Amjad et al. (2020b) based on a systematic review and

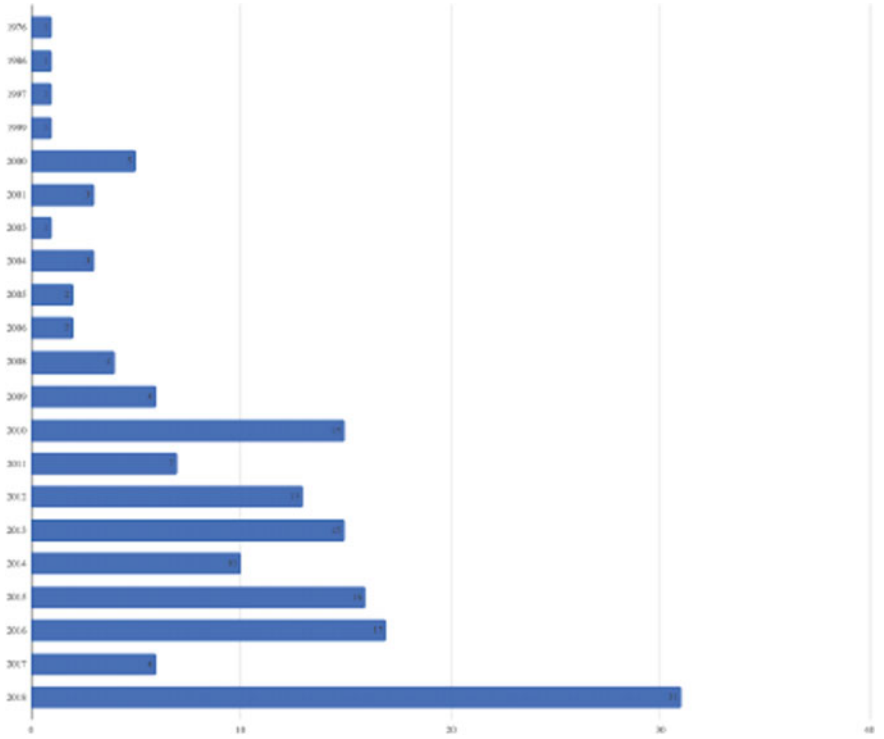

Fig. 1 Number of EM articles per year (Amjad et al., 2020b)

synthetization of all peer-reviewed literature in the period of 2008–2018, considered to be the era of much progress in the literature. These newly developed models, although provides further knowledge on the EM, are restricted by the controllers of the research behind them. Özdemir (2013) investigated the process of 'social value creation' in EM and presented a model of the whole process of creation. Furthermore, these represent only ten-out of the one hundred forty articles identified and examined-who have contributed to developing substantive models. This validates the viewpoints of this field to be substantially lacking theoretical models.

Another note made by the author on the models developed to be mostly based on deductive methods, where there is more need for inductive methods to support the development of fundamental theories and models that can stand as principles for the EM (Amjad et al., 2020b). Under the same state of art paper (Amjad et al., 2020b). Listed the varied theoretical lenses within which the EM has been examined in 20 articles from the 140 identified from 2008 to 2018. Among these lenses, two are shown to be of most frequently used, and thus tested. Moreover, are also referred to in some other papers to support the author's point of view. These are the Seven Dimension Model of Morris et al. (2002) and the EMICO framework by Jones and

Rowley, (2009). In building the seven dimensions, (Morris et al., 2001) suggests the EM to be particularly consistent with Resource-Advantage Theory.

These two lenses are tackling the dimensions of the EM, providing a brief on the nature of the EM phenomena and an explanation of the dimension comprising the theoretical lens/model. Thus, both are considered basic and descriptive. Amjad et al. (2020b) Seven Dimensions of Morris et al. (2002) are indicated to provide an overall primary model, while EMICO of Jones and Rowley (2009) are considered to be more comprehensive and inclusive of those of Morris et al. (2002). However, looking at the EMICO framework's fifteen dimensions, it is noticeable that some are more of functions and processes, such as understanding and delivering customer value, sales and promotion, research and development. The author indicates also that both do not cover the relationship between the dimensions. However, (Morris et al., 2002) indicates an overall frame for this relationship indicating that these dimensions are not independent and need not be available together to form the EM.

3.3 Multifaceted Understanding of EM

In this research, the author presents a multifaceted understanding of EM-based on the research development in supporting the explanation and exploration of EM. This multifaceted understanding is presented in the layering of EM as an Interface-influence between composing disciplines, as concepts and definitions, a Mindset, an Orientation, a Concept, a dimension, a strategy, and a process followed by a distinct view of marketing from the entrepreneur's point.

3.3.1 As an Interface—Influence

Franco et al. (2014) in their study on the exploration of the influence of the founder-entrepreneur and the role, this one plays in EM in SMEs and found that marketing is recognized as an important element for business growth and sustainability. However, the two cases studied showed that its role is not activated through the formal planning process, but rather through the informal and reactive process: mainly due to the restricted resources. A noteworthy conclusion claims that founder-entrepreneur have a high influence on the marketing in SMEs and is closely dependent on his/her decision. Being in charge of the whole business. Stokes and Stokes (2000) supports this view, highlighting that characteristics of the owner or manager have a dominant influence in SMEs. On the same point, (Martin, 2009) considers "the active role of an entrepreneur" as a factor distinguishing "formal' marketing from 'entrepreneurial' one in addition to the factor of "networks" that are considered to provide the link behind the phenomena.

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3.3.2 Mindset

Some studies suggest an alternative conceptualization, with EM understood as "marketing with an entrepreneurial mindset, irrespective of firm size or age" (Kraus et al., 2010). Adopting this mindset approach, they define EM as an "organizational function of marketing by taking into account innovativeness, risk-taking, reactiveness and the pursuit of opportunities without regard for the resources currently controlled", which compared to that provided on Fario, shows more toward entrepreneurship. The authors in presenting their definition indicate that it applies to large firms and shall not be limited to small ventures.

3.3.3 Orientation

EM as an orientation lies under the interface role of marketing in entrepreneurship and the other way. A stream of research is found to be focusing on orientation perspective with a focus on the marketing orientation and entrepreneurial orientation. These orientations also are considered based on the most frequently referred models of seven dimensions of Morris et al. (2002) and the EMICO of Jones and Rowley (2009). Morris et al. (2001) propose a relationship between the two orientations as "Coupling a market orientation with entrepreneurial values provides the necessary focus for the firm's information processing efforts, while it also encourages frame-breaking action, thus greatly increasing the prospects for generative learning". Morris et al. (2001) suggest another interpretation for this relation, where the authors consider that these two orientations may be "be part of a single, overriding organizational philosophy" and not only holding relationship among them.

3.3.4 As Concept and Definition

Yadav and Bansal (2002) indicates that the concept of 'Entrepreneurial marketing' emerged in 1982. In addition, since then this concept is defined from different perspectives and contexts. To define it, some tend to go in a straightforward position by describing it as "marketing carried out by entrepreneurs or owner-managers of entrepreneurial ventures" (Stokes, 2000). Kraus et al. (2010) views it from a mindset view and defines it as "the marketing activities with the entrepreneurial mindset". Franco et al. (2014) presents a description of its nature as being" informal and ad hoc in nature" and defines it as "a process with an Entrepreneurial Spirit".

Morris et al. (2001) could be considered as the first one introducing the term of entrepreneurial marketing as an integrative concept. That emerged as a response in the time of information intensity and the continuing change faced by the firms

in the environmental landscape within which they operate. Authors introduced this integrative concept, to conceptualize marketing within this context, and define it as "the proactive identification and exploitation of opportunities for acquiring and retaining profitable customers through innovative approaches to risk management, resource leveraging and value creation" (Amjad et al., 2020a).

This definition attributes to entrepreneurship from an activity perspective, with the similarities in the three main definition components if compared to the scale of Covin and Slevin on entrepreneurial activity, considered to be the most used one and is established about "risk-taking, innovation and proactive response" as the behavioral dimensions of the scale (Stokes, 2000). Some tend to view SME marketing as a synonym to EM. Franco et al. (2014) considers that Marketing in SMEs should be labeled as EM with attachment to similar contextual environments, making SME modeling an aggressive and unconventional approach, that enables the provision of the means toward success notwithstanding the limitation of resources. Although this contextual attachment holds relevancy, there are other main dimensions of entrepreneurial ventures that put limitations on this generalization, among these is the discard of resources when pursuing the opportunity, mindset, entrepreneurial activities, and others.

EM is defined by Becherer et al. (2012) as "effective action or adaptation of marketing theory to the specific needs of SMEs" and uses the term to describe the marketing process adopted by firms pursuing opportunities in an inexact circumstance of the market. As a contextual definition EM is used mostly in describing marketing conducted at firms of small and medium sizes, more often at the stages of the start-up or the following early growth one (Amjad et al., 2020a). These SMEs entrepreneurial ventures are mostly characterized by limitations on their human and financial resources, which as a response necessitates creative and innovative methods in marketing (Alshurideh et al., 2021, 2022; Amjad et al., 2020a).

Mort et al. (2012) adapts the seven dimensions of Morris et al. and defines EM accordingly as "the proactive identification and exploitation of opportunities for acquiring and retaining profitable customers through innovative approaches to risk management and resource leveraging for value creation". Morrish (2011) differs from the viewpoint of EM as a nexus between the two composing disciplines and tends to view EM as "an augmented process, where both the entrepreneur and customer are the core actors, co-creating value within the marketing environment". In this supporting, (Morrish et al., 2010) view of an entrepreneur being a central actor in the marketing process and equal to that of customer-defined as a focal point in traditional marketing.

EM is also viewed as "the Result of Entrepreneurial Interpretation of Information, Decision-making and Marketing Actions" (Hills & Hultman, 2011), where the entrepreneurial interpretation of the business environment influences the decision making and with actions, these are resulting in noticeable EM outcomes. Morrish et al. (2010) provides a definition for EM, that extends on (Morris et al., 2002) definition and incorporates AMA definition of marketing with "a spirit, an orientation as well as a process of passionately pursuing opportunities and launching and growing ventures that create perceived customer value through relationships by employing

innovativeness, creativity, selling, market immersion, networking and flexibility". This is seen as an attempt to define how an organization can adopt EM rather than conceptualizing EM.

Fiore et al. (2013) propose a comprehensive definition as "Entrepreneurial marketing is an organizational function and a set of processes for creating, communicating, and delivering value to customers and for managing customer relationships in ways that benefit the organization and its stakeholders, and that is characterized by innovativeness, risk-taking, proactiveness, and may be performed without resources currently controlled". Although this definition is provided as an extension to Morris et al. (2002) and the AMA definition. This stands as putting the two definitions together rather than defining it as a standalone one. Martin (2009) suggests the 4P's of: "person, process, purpose, and practices" as a frame better suited to understand marketing in entrepreneurial firms, where each of these new P's "is grounded in relationships and networks".

3.3.5 Dimensions

The most frequently referred work on the identification of the dimensions underlying the EM is Morris et al. (2002), proposing seven dimensions. These are namely, "Opportunity driven", "Proactiveness", "Innovation focused", "Risk Management", "Customer Intensity", "Value Creation" and "Resource Leveraging". The first four of these are based on the work of the number of scholars on the 'entrepreneurial orientation' of the firm and the following two on the market orientation, resource leveraging is relevant to entrepreneurship and marketing literature and the new marketing approaches. Although the concept of EM as introduced by Morris evolves around the role of marketing within the organization. The design and the seven dimensions of the new approach affects also the business represented by the organization/firm and their relationship with the marketplace (Morris et al., 2001).

The proposal of these seven dimensions provided a theoretical base and has been since then as the main underpinning theory used in several studies (Amjad et al., 2020b). Jones and Rowley (2009) built on these seven dimensions and number of "23 characteristics of EM" that are identified by Hills and Hultman (2011) and developed EMICO framework that evolves around the four of "entrepreneurial orientation (EO)", "market orientation (MO)", Innovation Orientation (IO)" and "Customer/Sales Orientation CO". The fifteen dimensions of EMICO are:" research and development, speed to market, risk-taking, proactiveness, market intelligence generation, responsiveness towards competitors, integration of business processes, networks and relationships, knowledge infrastructure, propensity to innovate, responsiveness towards customers, communication with customers, proactively exploiting markets, understanding and delivering customer value, and sales and promotion". Some views these to be more comprehensive than the seven dimensions, however these dimensions relate to function orientation more than dimensional one. Below further elaboration of each of the seven dimensions, clarifies further both the design of the concept and the new approach proposed for EM as an integrative concept (Table 2).

Table 2 Seven dimension of EM-(Morris et al., 2002)

Customer intensity" is proposed to "capture a sense of conviction, passion, zeal, enthusiasm and belief in where marketing is attempting to take the firm and how it plans to get there
Sustainable Innovation involves the ability at an organizational level to maintain a flow of internally and externally motivated new ideas that are translatable into new products, services, processes, technology applications, and/or markets
Strategic Flexibility: involves a willingness to continuously rethink and make adjustments to the firm's strategies, action plans, and resource allocations, as well as to company structure, culture, and managerial systems
Calculated Risk-taking involves a willingness to pursue opportunities that have a reasonable chance of producing losses or significant performance discrepancies
Environmental Proactiveness: redefine elements of the external environment in ways that reduce environmental uncertainty, lessen the firm's dependency and vulnerability, and/or modify the task environment in which the firm operates
Resource Leveraging: being not constrained by the resources currently controlled or owned

Morris et al. (2002) clarifies that these seven dimensions are not independent, where interventions in one of them affect the others. Furthermore, the operation of the whole of the seven dimensions together is not a condition for the EM occurrence, where EM could be in place with a number of these dimensions only. In stressing so, the authors clarify the gradation nature of EM, where the different amalgamations resulting from these seven dimensions show a degree of less or more EM. And when the combination considers these seven dimensions collectively, the resulting marketing does differ considerably from the formalized marketing giving.

Amjad et al. (2020a) proposed another dimension to be added which is 'legitimation'. Although this work is the first to introduce it as the eighth dimension, 'legitimation' is identified to be integral to entrepreneurial success in the study of Amjad et al. (2020a). Mort et al. (2012) identifies legitimacy as one among four key strategies identified for EM. Amjad et al. (2020a) defines legitimation from the perspective of EM as "legitimation exhibits the reliability of a firm/entrepreneur, which positively influences the trading decisions of the immediate audience". In advancement of Morris et al. (2002) work, (Fiore et al., 2013) provide scale validation for the seven dimensions in small firms, with proposed scale validated showing the influence of the entrepreneurial intentions on the EM and the role the latter plays on 5Ps and 4Es affecting the Brand distinctiveness.

3.3.6 EM as a Strategy

Three entrepreneurial marketing strategies are highlighted in Morrish (2011) and are concerning market driving approach under market-oriented overall one. These include deconstruction, construction and functional modification, and are applied by EV aiming to "reshape customer preference and behaviour" covering anticipation of future ones as well.

Mort et al. (2012) identify four core strategies for EM, where the authors find that it is through "purposeful strategy based on effectuation approach" that EM contributes to the outstanding performance in small firms. In their work, Mort et al. examined EM in "born global firms" or "International new venture INV" covering high- and low-tech industries, where this internationalization and globalization context within different industry profiles provides a wide perspective to examine the EM process and its impact on performance, leading to the understanding of EM strategies.

Core strategies of EM identified that are found to be contributing to the firm performance when applied strategically are "opportunity creation; customer intimacy based innovative products; resource enhancement; and legitimacy" (Mort et al., 2012). These core strategies when viewed from the concept and dimensional frameworks presented above are found to be augmenting on these. With the dominance of the key elements of opportunity, customer intensity, innovation, and resources (Table 3).

Morrish et al. (2010) under their viewpoint of EM as being both Customer and entrepreneur-centric, provides a frame for EM strategy suggesting "EM firms focus on the needs, desires and motives of both the customer and the entrepreneur to shape the firm's concept of strategy and its tactical processes". Swenson et al. (2012) suggests an entrepreneurial marketing framework that helps in creating opportunities from a competitive angle base. and that also supports marketing strategy development. Their framework provides a systematic approach for the evaluation and execution of the EM and is composed of 5 elements: Opportunity Creation; effect multiplication; relationships leveraging; process acceleration; and profit-making. Where opportunity creation is attached to the choices on competitive angles and is considered to be of importance in identifying losers and winners in the startup context. Competitive angles are composed of five facets (1) need to believe, (2) reason to believe, (3) blows away expectations, (4) quantifiable support, and (5) unique product claim (Swenson et al., 2012).

In a contrast to the research proposing EM as having a different strategy frame, (Phua & Jones, 2010) finds that entrepreneurs indeed use existing marketing tools in the daily management of their venture. They do also use marketing strategies in a notion to the exaggerated myth of the informality nature of planning activities in small firms. However, the authors stress the limitations of the study are based on four NES entrepreneurs and that cannot be generalized as a rule. And that this doesn't exclude informal marketing practices from being adopted. A notion on this is the pattern matching method used in matching the studies practices in the marketing strategy model adopted by the authors, which results in a tendency to a framed analysis of the activities within the model.

3.3.7 Process

Fiore et al. (2013) suggests that "EM is a complex process as well as an orientation for how entrepreneurs behave in the marketplace". The term Entrepreneurial Marketing Processes (EMP) is conceptualized by Miles and Darroch (2006) as the

Table 3 Core Strategies of EM from Concept and Process Relevance

Core strategies	Concept/dimensional relevance	Process relevance
"Opportunity Creation": where opportunities that do not previously exist are created actively. Rather than the identification of pre-existing ones and exploitation of them This is valid with the emergence of new challenges needed to be tackled An ongoing multifaceted process	Advancement on opportunity orientation, where opportunities are to be discovered	
"Customer intimacy based innovative products": the ability to develop marketable innovative products based on ongoing relationships with customers and intimacy	Nexus amid sustainable innovation and "customers intimacy", linking both in one strategic dimension	Contrasting the process of a new product (Mort et al., 2012) Advancing EM in empirical clarification of the Iterative process of customer intimacy and innovative product development
Resource enhancement: highly developed ability to identify and mobilize resources from external sources, enrich and extend existing internal resources and recombine these in a novel, elaborated ways with a strategic purpose	Extending on resource leveraging Mort et al. (2012) sees that (Morris et al., 2002) considers resource leveraging as a dimension as "the ability to use other people's resources" making them able to overcome the limitations, where they consider it as developing new combinations	
Legitimacy Strategies and tactics used to get marketing acceptance and trust for the firm and its products and services		

Source Author based on (Mort et al., 2012)

marketing processes emphasizing" "opportunity creation and/or discovery, evaluation and exploitation" (Kraus et al., 2010). Entrepreneurs are likely to have a different view of marketing. Stokes (2000) investigated the definition of marketing from the perspective of entrepreneurs and with a focus on the strategic level of process, his work is based on data from face-to-face interviews with forty entrepreneurial characteristics, along with following focus groups in two series. Results from this show that entrepreneurs tend to define marketing from the tactics component-third level in marketing after culture and strategy—with the goal of new business attracting.

His work also reported less awareness of the strategic and culture-related levels. In some parts, this is related to not being aware of the terminology, rather than ignoring it. Furthermore, focus groups show that considerable resources, effort and time are spared on marketing but are flagged by another name. His work defines the Entrepreneurial marketing process, through the differences between the "giving's of marketing theory", and insights provided by what successful small businesses and entrepreneurs do. This definition is better understood as a comparison along the four components composing marketing (concept, strategy, tactic and marketing intelligence) each compared between the two sides of conventional marketing and entrepreneurial marketing and resulting in four main aspects defining the EM.

At concept or cultural components, the key difference is in the orientation directing the new product or service development. "The idea comes first and the check for market acceptance second" (Stokes, 2000). Thus, under EM the process is more toward Innovation oriented, implying that that idea, intuition or competition pressures stimulate the process followed by finding the market. This stands as the other way, compared to the customer orientation in conventional marketing, where study, assessment, or research of market needs establish and commence the process of new product development. Stokes (2000) also indicates that under EM, customer needs remain as a key issue, but the core difference is that in most cases ideas or intuitions are transformed through innovation activity to new products or in some cases into defining total new markets in the case of disruptive innovation.

Under the strategic process component, a key difference is attached to the direction or route of strategizing. Entrepreneurial founders-manager, while developing strategies, lean toward a "bottom-up" direction, where a majority of marketing textbooks advise "top-down". Formalized Strategy involves processes toward attaining customers with applying segmentation, targeting and positioning sequentially ordered; segmentation is developed using different criteria to develop segmented profiles, followed by the assessment of these segments and their attractiveness to inform the selection of targeted one; position is then developed and communicated resulting in the differentiated offering.

Under EM "bottom-up", the direction is more of reversed one in process order, where targeting starts at a smaller scale base of customers and then widens up to attract more. This process is articulated in three main stages; market opportunities detection through non-formal, ad-hoc actions and intuitive based testing; initial customer base attraction, and through the regular contact with this initial base during this stage, entrepreneurs become more knowledgeable by their needs; followed by the extension of this base, with attracting more customers of similar profile that is confirmed in the prior stage. Also, this expansion is more of non-formal nature and involves methods such as word of the mouth (Stokes, 2000). The small-scale base at the initial stage and the regular contact enables a wider definition of customers, beyond the end-user, consumer, or the one who buys, to cover the whole network of supportive.

Under Tactical methods, a key variance lies in "4P's" versus "Interactive and Word-of-Mouth Marketing"; where the marketing mix of product, price, place, and promotion design the marketing program for the product or service, developed based on the understanding of the marketplace. On the Entrepreneurs' side, their activities

seem to have different methods of themes, focusing on 'interactive marketing' that comes in harmony with the "bottom-up" approach, and that involves direct interaction and development of personal relationships with their customer. This conversational relationship enables entrepreneurs to have a deep understanding of their customers, built through the process of listening and responding.

However, this is enabled with the small initial base of customers and could be of higher challenge to maintain with the expansion of this base while moving toward top level in their approach. Notwithstanding this challenge, this "meaningful dialogue" remains one of the key differentiators. To overcome this, these interactions are tied with "Word-of-Mouth" marketing that enables spreading the message and expanding the customer base. In addition, is defined as "Oral, person-to-person communication between a perceived non-commercial communicator and a receiver concerning a brand, a product or a service offered for sale" (Stokes, 2000). Finally, concerning Marketing intelligence "Market Research" versus "Networking" delineates the key difference, whereas in traditional marketing formal research and market intelligence inform the different stages of marketing such as market segmentation and targeting. Entrepreneurs tend for lateral and non-formal methods, where information is gathered through their contacts' network of those involved in the industry or trade (Stokes, 2000).

Although seems confusing to compare traditional marketing to EM on a concept versus processes base, it shows to be a valid comparison to understand and define. Where processes are referred to about the primary source of forty face-to-face and focus groups, aiming in a different method to identify the EM and define it from how Entrepreneurs see it and practice it through a process of a set of activities. Stokes (2000) propose a framework or entrepreneurial marketing process through the combination of four strategic processes differentiating it from the formalized giving of marketing. As a process, another dimension is the management of the EM. Collinson and Shaw (2001) identifies three themes differentiating management of EM. These are the process, the position of marketing within an organization and the approach. The process of managing EM is described to involve a shorter process of decision–making headed more often by minute formal planning. This differs from managing regular approaches to marketing, main reason lies in the contextual environment of EM with fluctuating and changing one, where time consumed for the regular planning process is not valid and may end in obsolete outputs with the change occurring.

Under the organizational position of marketing, this position is more often adopted as the guiding philosophy in entrepreneurial ventures. With the organizational activities orientating around marketplace and customer. This is valid, even though in most EVs no identified market section is in place, and no individuals are assigned responsible solely for this. Gearing the above two themes is the informal approach most often adopted for managing marketing in EV. Portraying this approach is the organizational-level commitment of grasping, foreseeing, and responding to the needs of a continually changing marketplace. This makes marketing activity under the ownership of the whole organization and managed by the whole, decreasing the

Fig. 2 Formalized Process of Marketing Giving's. *Source* Author contribution based on Collinson and Shaw (2001)

importance of managing it in a formal approach. The above allows for more flexibility, where formal approaches cannot hold this nature within the sequential order of process and the gates at each required to activate the others. The below graph illustrates the sequential order of formalized process of marketing gives (Fig. 2).

The key issue distinguishing EM is related to the effectual logic or frame. Within this logic of decision-making, entrepreneurs are found not to believe in the possibility of predicting the future, which explains why they do not attach great importance to set objectives as the case in the causation frame. Instead, they are found to be starting with the means and what they have "tangible and intangible assets", the things they can do "capabilities", and those whom they know "networks" and with these, they establish variant options of diversified ends (EM, 2012). In their work of investigating the EM in practice and from a social practice theory perspective, (Gross et al., 2014) notes that particularly in small firms, the activities of marketing extends beyond the mandate and scope of the marketing department designated, furthermore it is more likely not to have a dedicated role of marketing. In their work, they emphasize that firms adopting EMPs are "better suited to discover and create, assess, and exploit attractive entrepreneurial opportunities and that this enhanced level of corporate entrepreneurship enables the EMP firm to more effectively and efficiently create and renew competitive advantage" (Miles & Darroch, 2006).

4 Why the Paradigm Shift

The practice in marketing witnessed raising critique of various issues, with the main notion of on the criticism of traditional marketing related to the "one size fits all" assumptions of marketing theory (Martin, 2009). In addition to this comes "an over-reliance on established rules of thumb, encouragement of formula-based thinking [….] an emphasis on the promotion elements of the marketing mix [….] the tendencies to imitate instead of innovating and serve existing markets instead of creating new ones, a concentration on short-term, low-risk payoffs, and marketing as a silo with static and reactive approaches (Morris et al., 2002). Along with this comes

the notion of increasing evidence highlighting the insufficiency of "conventional marketing approaches" in addressing and tackling the needs of the firms working in contemporary environments with the changes these environments are witnessing. France et al. (2014) sees that this competitive paradigm witnesses continuous change. In reflection of current changes and mega trends, this is further forced with the issues of technological advancement and the fourth industrial revolution, competition on local, regional and global affecting new and emerging needs of the customers. The market is furthermore described as context-dependent by Morris et al. (2002), and nowadays more than before this context is continually changing, with multidimensional changes and a larger number of forces driving this change. Since 1999, suggestions on the need for a reconceptualization of marketing are proposed. Arguing that development of the discipline building on the extension of the existing theoretical frameworks possibly will not be enough to reflect the changes and shifts in the marketplace, and consequently guiding the practice in the new context (Morris et al., 2002). The same extends to academia and the gap in contribution to marketing practices.

In another strategic critique, (Miles & Darroch, 2006) noted that "Much concern has been expressed about the relationship of marketing to innovation. The marketing concept, it is argued, has contributed to the death of true product innovation in North America." Morrish et al. (2010) also, mark that entrepreneurship is needed for firms to grow. Along with this, EM emerged as providing a more effective and efficient model substituting the formalized marketing giving. The literature body in the EM is showing increasing consensus that EM differs substantially from the conventional one (Mort et al., 2012). This is supported by the works of Stokes (2000), Morris et al., 2002). Some scholars developed their work responding to the challenge made to EM scholars "to [more] fully develop EM as a school of marketing thought," (Mort et al., 2012).

Mort et al. (2012) indicates that noted contributions are provided to the 'emerging paradigm' of EM by several authors. With implicit propositions on the superior role of EM on value creation. The author also disagrees with the point of labeling EM as unplanned, rather they send the view of EM being non-linear activity in harmony with characteristics of effectuation proposed by Sarasvathy as indicated by Morrish (2011). This represents one of the key contributions of Mort et al. (2012), in the raise of EM being an effectuation rather than causal. Under effectuation (Mort et al., 2012) explains that entrepreneurial ventures have broad known goals however the ways to get to them cannot be approached in a logical process following causal setting. This causal setting seems to be more appropriate for the case of existing firms aiming at increasing market share in their existing markets (Morrish (2011) defines the effectuation processes as that which "take a set of means as given and focus on selecting any of the multiple possible outcomes or effects".

Collinson and Shaw (2001) identifies structured management and its impacts on the approach for marketing as one of the key issues making entrepreneurs apart from adopting it. With the preference for a more flexible, non-sequential approach. On the same point, the focus of most textbooks in marketing and management is focused around this structured and ordered approach. Morrish (2011) make a good referral on the omission of the marketing mix from the then-recent AMA definition, raising the

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point of the development of functional focus toward process focus with increasing the importance of this process and the network. Another force driving the change is the issue related to the changes at the consumer side, where studies show more focus on the characteristics of a contemporary consumer being more knowledgeable and discriminating, and the consumer tendency to focus on experiential and intangible factors (Fiore et al., 2013).

The paradigm shift is raised by Hill and Wright in a note that a "paradigmatic shift would allow for the full expression of the entrepreneurial personality in the management and marketing activities of the SME" (Martin, 2009). In their note Hill and wright bring up the argument that a new entrepreneurial paradigm of marketing could be created from the further complete adjoining of both marketing and entrepreneurship. Behind this, several scholars question the major elements of textbook marketing. Gronroos debates the high questionability of the usefulness of the general theory of the 4P's, while others raise the issue of missing the "fundamental point of marketing—adaptability, flexibility and responsiveness" with strict adherence to the 4P's" (Martin, 2009).

Hills and Hultman (2011) investigated the relation of EM to mainstream marketing, to the 'paradigm discussion' on the relation of EM to marketing discipline described as one of the EM's parents. In their analysis, they note that the U.S marketing stream dominating of the discipline for decades, with the AMA revisions for definition made in 1935,1982,2004 and 2007. These revisions reflect the evolution on the focus from the performance of business activities to the focus on the process of planning and executing, followed by the focus on marketing as an organization function, in addition, to set of processes, and recently on the comprehensiveness of activity, institutions, and process with the exchanging brought up as part of value creation. However, (Hills & Hultman, 2011) sees EM as a research field to be supplementing the market mainstream theories, however through focusing on marketing as done by entrepreneurs. Renton et al. (2015) notes the recognition in the latter literature in EM of entrepreneurs "doing" traditional marketing, but the form of doing this is not understood fully. Entrepreneurs are found to use practices that are recognized as traditional marketing but in a different approach and themes. They "do so in adaptive, intuitive, opportunistic and pragmatic ways, fitted to the needs of the business" (Renton et al., 2015).

With this in mind, the social practice theory emerges as a strong base, and with the emergence of the research stream of marketing-as-practice, that is focusing on the "actors, practical activities, performances, representations and tasks involved in the complex performance of marketing" (Gross et al., 2014). This provides a response to nature required. The social practice also provides the potential of investigating the "practical marketing practice (doing or praxis) of the firm, which is permeated and characterized by the behavioral and cognitive attributes associated with entrepreneurship" (Gross et al., 2014).

4.1 The Recent Business Environment and Drivers for a Shift

Morris et al. (2002) describes the business environment, which is still valid in parts of it in describing today's environment. Being consisting of "increased risk, decreased ability to forecast, fluid firm and industry boundaries […] and new structural forms that not only allow for change but also help create it" this fluid, rapidly changing nature is further augmented with the advancement in data and information, the fourth industrial revolution, global and regional market exposure and other issues. Amjad et al. (2020b) attaches specific importance to the economic and social challenges in developing countries, resulting in further uncertainty and higher risks compared to the conditions in developed countries. These conditions are among the main drivers for entrepreneurs toward EM, being more suitable at such conditions (Amjad et al., 2020b).

At the global level, entrepreneurship as a means for economic development represents a key concern (Amjad et al., 2020a). This concern has raised the importance of entrepreneurship role. However, this is challenged at the entrepreneur's levels with some issues they face in the field including market dynamics, rapid changes, competition, uncertainty and at the top of it is the pandemic caused (Amjad et al., 2020a). The market can no longer be considered as a "given" issue or place for transactions as considered by the positivist school of thinking. It is being shaped more toward "potential" things according to the constructivism school of thinking. Thus, it is more a process of socio-relational nature, where providers or producers and customers or consumers engage in a co-consumption and co-production of lifestyle, identity in addition to the product (EM, 2012; Al-Dmour et al., 2020).

4.2 Labeled-Termed Marketing

Labeling or terming of the existing principles of marketing is noticed along the course of the emergence of EM research and the new methods of marketing. This is evident with the various adjectives attached to marketing such as "conventional", "conventional wisdom", "traditional", "standard", "administrative", "textbook marketing", "corporate traditional marketing" in referral to the existing principles and the course of marketing textbook givings. This labeling is used to refer to the "formalized market giving's", that the author refers to -under this paper- to indicate the existing prevailing course of marketing. And this terming holds two folds first; the terming for comparison purposes with the EM or new approaches to identify the differences; the second one relates to the description and exploration of the mainstream and consequently understanding the reasons behind being no longer sufficient to respond and tackle the new shape of the environment. All papers studied under the work for this paper include this labeling/terming except for two of them that are (Kraus et al., 2010) and (Uslay & Teach, 2009). Where the most used labeling terms are found to be traditionally followed by conventional. And these are used interchangeably in most of the papers.

Morris et al. (2001) use the terms of traditional marketing and conventional marketing interchangeably and introduce a detailed comparison contrasting conventional marketing from EM. Traditional marketing is the one more used by Stokes (2000) and refers to as "marketing as presented in standard textbooks such as Kotler" the author also presents a comparison between the traditional marketing process and the EMP. The author also uses the term conventional marketing but less frequently than traditional. Amjad et al. (2020a) use the term traditional marketing, with the examples of "traditional marketing textbooks" to include "Brassington & Pettitt dated 2007, Jobber dated 2009 and Kotler et al. dated 2008". The same author (Amjad et al., 2020b) uses the term standard marketing about marketing in textbooks noting it"was originally developed for larger enterprises, and it widely ignores the marketing particularities of SMEs". Collinson and Shaw (2001) use traditional marketing indicating being operated in a consistent environment, characterized by continuous market conditions and clear satisfaction of perceived needs of customers. Morrish et al. (2010) use traditional, conventional, and administrative in addition to presenting a comparison between administrative marketing and EM on the strategy and tactic levels. EM (2012) use traditional marketing with a dedicated section comparing EM to it. The traditional market is described by the author as "exclusively customer-centric focused" also refers to it as administrative marketing.

Farsi et al. (2018), Fiore et al. (2013), Franco et al. (2014), Gross et al. (2014), Miles and Darroch (2006), Phua and Jones (2010), Stokes and Stokes (2000), Swenson et al. (2012) use the term traditional marketing. The latter also uses the term administrative marketing. Becherer et al. (2012), Mort et al. (2012), Renton et al. (2015), Yadav and Bansal (2002) use both traditional and conventional marketing interchangeably. While (Jones & Rowley, 2009) uses conventional only. Some authors use other less frequently used terms where (Martin, 2009) use the term corporate/traditional marketing (CTM) composed of the culture, strategy, and tactic. Morrish (2011) use the term traditional marketing wisdom in addition to administrative marketing. Hills and Hultman (2011) use the term traditional mainstream marketing. Gruber (2004) uses the more generic term of conventional wisdom referring to textbooks. This labeling/terming shows the growth of the views toward formalized market giving and the main textbook giving's as no longer sufficient, and lacking the tools and approaches required especially in the new ventures and SMEs. The literature also indicates that formality and over-reliance on given rules and methods resulted in lower levels of innovation and proactiveness.

5 An-Approach Based Paradigm Shift-Discussion

A paradigm shift is defined in the dictionary as "an important change that happens when the usual way of thinking about or doing something is replaced by a new and different way". The term is used for the first time by Thomas S. Kuhn in his writings between (1922–96), with the view of a paradigm shift as" a fundamental change in approach or underlying assumptions". Three main forces are defined to be driving

for a paradigm shift of the prevailing marketing giving, these are the critique of the giving and principles deemed to be no longer sufficient in the contemporary market; strong emergence of the EM as a field, and new marketing school of thought with the views toward EM as a concept valid for the large size firm as well as the new ventures and SMEs; nature of the landscape composing the market and business environment at the different levels with the rapidly changing and fluid boundaries being nature of this market rather than occurrences; change at customer side with the globalization and open markets making the customer more knowledgeable. All under the umbrella of information technology advancements and the fourth industrial revolution, raising disruption almost across all industries.

While marketing remains as the main discipline and one of the key issues of the success for any firm, of any size, within any context, across the full spectrum of industries and markets. These forces raised since the -90's in some of them- elevate the need for a bold evolution in the prevailing school of marketing. An evolution that builds on it but views it in other frames and theories to yield a novel one, and no extension of the existing ones to develop theories for new challenges. The extension of the existing theoretical frames is seen to be no longer sufficient in reflecting shifts in the market landscape (Morris et al., 2002). EM with the development in the research field provides a strong groundwork for this evolution seen as a paradigm shift. A shift on the approach-based layer or frame and not on the detailed levels of strategy, tactic, or process. As detailed levels do not allow for a comprehensive frame of revision, that addresses the paradigm at the school of thought. The frame for this approach-based paradigm is composed of the main four elements/dimensions, derived from the main forces calling for the change. These are resilient management; scalable/gradual matter of sub-frames including multi-dimensional orientation effectual-causal, proactiveness-reactiveness; living strategic process, and Entrepreneurial Innovation. This shape the approach-based paradigm to be resilience in taking and managing risks without severe impacts, dynamic with flexible scalability allowing for the activation and deactivation of the sub-dimension according to the landscape of operation, and with living strategic process that allows for smooth capturing of changes and seamless reflection on the processes all with entrepreneurial innovation that is also gradual but activated as deemed necessary for the growth of the firms. Ironically, marketing concepts are also considered to be about change, but different than entrepreneurial activity/process in a further methodical and structured way (Stokes, 2000).

Effectuation theory provides a supportive frame for resilience. Effectuation allows the changing goals and shaping and re-constructing them over time and making use of the contingencies arising over time (Hills & Hultman, 2011). The proposed paradigm, support deliberating the marketing as a discipline from being organizational or context defined and allow for a flexible frame instead that augments on the theories and practices of new approaches and models and provide a conceptual frame that overrides the different views supporting the formal or informal planning, sequential or fluid and the other various points on the sort of orientation better suited.

Another note is made on the conceptual nature of the paradigm proposed this links with the academia and the practice field. Where the definition and structure of the framework provide the understanding of the term or issue of study, while concept proposals allow for the overall perception and further case-level interpretation. This allows for increasing innovation that is not restricted in the structured forms or given order of thinking. Concepts shall give the overall understanding without putting rigid frames to enable flexibility required more than before in the current landscape, and also allow for more creativity and innovation in projecting these concepts under different contexts, contents, cultures, etc. this is the core of the proposed paradigm.

6 Conclusions and Future Work

The objective of this research is to augment the research field of Entrepreneurial Marketing as a concept and approach, and the substantial differences it holds in comparison to the prevailing giving of the marketing. In doing so the research aims to explore and analyze the causes and drivers that resulted in the emergence of EM as a new school of thought in addition to other new approaches, and how these are understood as better suited for the ventures in the contemporary market and the shifts the marketplace is witnessing. When compared to the formalized giving's of marketing referred to frequently with "traditional marketing" and "conventional marketing". It is noted that EM is viewed to be fundamentally different than formalized giving of marketing, with this difference examined at the different levels of concept definitions, mindset, influence, dimension, strategy, and process. With the recent tendency for addressing EM as suitable for large firms as well as EV and SMEs.

Along with the emergence of the EM, it is also found to have an emerging criticism for the formalized giving of marketing and the rules set. With the infer that these giving's requires development if to be sufficient in addressing the market shift needs in the long run. It is concluded that this is also implicitly rooted in the changing in the landscape of operation and the customer side. Covering market, business, and economic landscape. Augmenting on the above, this research proposes an approach-based paradigm shift frame for the formalized givings of marketing. The proposed paradigm responds to the drivers of evolution concluded in the study and expands on the evolution in the EM in defining the main dimensions conceptualizing this proposed paradigm.

The main contribution lies in the proposed paradigm linked with the driving forces for the need of the shift. However, this research also provides a contribution in the EM literature in exploring EM in a multi-faceted perspective integrating the advancement and development in the field. It also contributes under the labeled/termed marketing introduction, aiming to have a bold move toward responding to the change needed to the marketing discipline.

Limitations on the work are represented by the literature focusing on EM, while other new approaches require study to aid the development of the paradigm. In addition to the literature specifically on the critique of formalized giving's of marketing

to view other possible forces of change. This paper is a concept paper, proposing a conceptual paradigm. Where the proposed paradigm requires further work to develop and examine within inductive methods.

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A Development of a Newly Constructed Model Related to the Impact of Entrepreneurial Motivation on Entrepreneurial Intention

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Abstract The current research developed a model which included Entrepreneurship Motivation (EM) as a higher order construct that consists of twelve first order indicators (need for achievement, need for autonomy, need for affiliation, need for power, subjective norms, attitude toward becoming entrepreneur, perceived behavioral control, governance motive, financial motive, economic motive, creativity and risk taking) and considered EM as an independent variable for Entrepreneurial Intention (EI). The current research methodology employed a quantitative approach, in which data were administrated and gathered via an online and face-to-face survey with entrepreneurs in Jordan; 221 surveys were collected, the data were later tested using a (SEM) via AMOS program. The findings of this research showed that need for achievement, need for autonomy, need for affiliation, need for power, subjective norms, attitude toward becoming entrepreneur, PBC, financial motive, creativity, and risk taking are considered as indicators for EM, whereas governance motive and economic motive were not indicators for EM.

Keywords Entrepreneurship · Entrepreneurship motivation · McClelland's theory · Theory of planned behavior · Entrepreneurial intentions · Jordanian context

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_86

1 Introduction

The significance of entrepreneurship as a contributor and supporter to venture creation, economic development, and innovation is widely recognized (Alameeri et al., 2021; Hopp & Stephan, 2012; Nabi & Liñán, 2011; Qandah et al., 2020). Therefore, it is essential to define Entrepreneurship as a concept. In particular, entrepreneurship is the creation and application of new opportunities in an uncertain and complex environment (Neck & Greene, 2011) that drives sustainability and growth in an economy (Rasmussen & Sorheim, 2006). In addition, it is considered as a phenomenon encompassing the action of humans; it means that the entrepreneurial process exists because opportunities are being exploited by individuals, and as similar, human roles cannot be overlooked (Shane et al., 2003). Taking this point further, starting a new business relies largely on intentions as suggested by a growing body of relevant literature (Bird, 1988; Liñán & Chen, 2009a; Schlaegel & Koenig, 2014). Several previous studies confirmed the aforementioned assertions by stating that the development of entrepreneurial intention is followed by entrepreneurial activities (Douglas, 2013; Shook et al., 2003).

Furthermore, it is important to be motivated to insist and continue until the work is done and goals are achieved (Farhangmehr et al., 2016). Hence, Entrepreneurial Motivation (EM) is viewed as observable and behavioral and is connected to the organizational growth, survival and origin (Bird, 1995). More specifically, EM represents relevant particular goals to which potential entrepreneurs believe and aspire they can accomplish with new ventures, and accordingly their beliefs will motivate them to implement an entrepreneurial action (Kuratko et al., 1997).

After examining the previous studies about EM, it is noted that these studies did not developed a comprehensive model to measure the indicators affecting EM. For that reason, this research aims to examine the indicators that affect EM, and the effect of EM on EI. In addition and based on reviewing previous studies, it is found that different theories were used to measure EM, where needs theory (McClelland, 1961) was used in various studies (Jayachandra, 2011; Lee, 1996; Sethi & Saxena, 2006), while theory of planned behavior was used in several other EM studies (Malebana, 2014; Solesvik, 2013). In addition to that, there was no agreement in the natures or the number of the indicators to measure EM, such as, some studies used the three needs theory (McClelland, 1961) to measure EM whereby four indicators were included (Sethi & Saxena, 2006), while seven indicators were examined in another stream of research (Jayachandra, 2011). Whereas the theory of planned behavior related studies examined EM with eight indicators (Malebana, 2014) and others with only three indicators (Solesvik, 2013).

For this reason, this study developed a model with an extended theories and variables from different studies to measure EM by adopting the needs theory (McClelland, 1961), and theory of planned behavior (Ajzen, 1991), in addition to other influencing variables as recommended in the existing relevant literature such as governance motive (Aziza et al., 2013), financial motive (Aziza et al., 2013; Hessels et al., 2008; Sarri & Trihopoulou, 2004) economic core motive (Aziza et al., 2013; Vijaya,

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1998) creativity (Estay et al., 2013), and risk taking (Estay et al., 2013; Jayachandra, 2011; Nishantha, 2009; Segal et al., 2005). Further, the current study will add to the current knowledge regarding the relationship between EM and EI by examining the influence of EM as a multidimensional construct on EI in the Jordanian context.

EM described briefly in this background discussion, and it focuses on the need of having deeper knowledge and understanding the indicators of EM and its effect on EI in a wide range approach with the following objectives:

(1) To understand the key dimensions of EM from a theoretical perspective.
(2) To understand the key dimensions of EM from a statistical perspective in the Jordanian context.
(3) To investigate the level to which EM influences EI in the Jordanian context.

2 Literature Review

To provide a comprehensive understanding of this research, an intensive revision of the relevant literatures related to EM and EI has been conducted. EM topic is very broad and explored by many researchers (Shane et al., 2003; Jayachandra 2011; Lee 1996; Malebana 2014; McClelland, 1961; Sethi & Saxena, 2006; Solesvik, 2013; Aziza et al., 2013; Antonioli et al., 2016; Batchelor et al., 2014; Fereidouni et al., 2010; Hackman & Oldham, 1975). EM is defined as the willingness and propensity to manipulate and control companies, thoughts and human beings as independently and rapidly as possible (Johnson, 1990). Previous research found that EM impacts the growth of small business (Delmar & Wiklund, 2008). On the other hand, a significant relationship was found between EI and EM (Achchuthan & Nimalathasan, 2013; Solesvik, 2013). Some researchers found that there is a link between EI, motivation and behavior in which they showed that since intentions cannot transform immediately into action, then motivation is considered as link between EI and actions; motivation will translate an intention into real action (Carsrud & Brännback, 2011).

2.1 Three Needs Theory

Various theories and indicators have been used to measure EM (Collins et al., 2004; Shane et al., 2003). For example, many studies have examined the Three Needs Theory developed by McClelland to measure the EM. Taking this point further, (McClelland, 1961) suggested that the high need for achievement was the personal characteristics common to entrepreneurs, in support to this, a numerous research has focused on entrepreneurs' characteristics (Churchill & Lewis, 1986; Shaver & Scott, 1991). In particular, by duplicating and extending the Three Needs Theory, several studies included this theory in their investigation such a study which was conducted by Lee (1996) to examine the indicators that influence the motivational needs of entrepreneurs. These indicators include need for achievement, need for

affiliation, need for autonomy and need for dominance and the results demonstrated that entrepreneurs will be motivated by a high need for achievement, a moderate need for autonomy and affiliation and a little high need for dominance. Moreover, it was found that entrepreneurs need a higher need for dominance and achievement than employees, and a significant difference in the needs for autonomy and affiliation (Lee, 1996). In contrast, another study used the same theory with the same variables but they found that need for achievement have a crucial role in EM (Sethi & Saxena, 2006).

Other studies have focused on investigating EM using psychological traits (Bygrave, 1989; Robinson et al., 1991). For instance, (Bygrave, 1989), developed a model and confirmed that need for achievement, tendency toward risk-taking, ambiguity toleration and inner locus of control act determinants of the entrepreneurial motivation. However, (Robinson et al., 1991) found in their study that the accomplishment, self-confidence and the locus of control are the most significant indicators that are predicting entrepreneurial behavior.

2.2 Theory of Planned Behavior

Other researchers have emphasized on examining and measuring EM using the Theory Planned Behavior (Ajzen, 2012; Malebana, 2014). This theory suggested that an individual's intention to perform or not to perform an action is the most important determinant of action (Ajzen, 2012). In particular, (Malebana, 2014) found that EM is a significant link between EI and entrepreneurial action; hence, it is suggested that the theory of planned behavior should be utilized to explore the determinants of EM and EI. Depending on the theory of planned behavior, there are several studies used this theory to determine the effect of the following three variables (attitude toward entrepreneurs, subjective norms, and PBC) on EM and their role in forming EI (Solesvik, 2013). These three particular variables were found to affect EM by mediating the relationship between EM and EI. While, (Locke et al., 2001) extended the Theory Planned Behavior theory in his research by adding five variables (EI, entrepreneurial role models, social valuation of entrepreneurship, knowledge of entrepreneurial support and perceived barriers to start a business) to determine their effect on EM. The findings showed that the attitude towards becoming an entrepreneur, entrepreneurial support, subjective norms, social valuation of entrepreneurship, EI and knowledge of entrepreneurial role models have a great influence on EM (Baum et al., 2001).

Various approaches and methods have been used to measure EM (Collins et al., 2004; Shane et al., 2003). For example, one of the studies suggested that need for achievement, locus of control, risk taking and goal settings are major indicators contributing to the formation of EM. While other studies measured EM with passion, independence and drive factors (Collins et al., 2004; Shane et al., 2003). In addition to that, other related studies to EM developed their models based on key previous studies within the EM context. For example, some researchers examined need for achievement, locus of control, vision, desire for independence, passion, drive, goal

settings and self-efficacy as an indicator that will impact EM (Baum et al., 2001; Hisrich, 1985; Locke and Latham, 1990; McClelland, 1961; Tracy et al., 1998). Whereas another study conducted by Nishantha (2009) measured EM including the following indicators: personality traits (internal locus of control, need for achievement, and risk taking), and socio demographic background (parents' occupation, gender, self-employment, and (Nishantha, 2009). One more research made their model as a comparison to determine where the focus should be to be motivated in order to start a business between psychological behavior variables, which includes achievement striving, social networking and optimism, with external environment variables which is the perceived importance of a favorable business environment (Alameeri et al., 2021; Taormina & Lao, 2007). They concluded that both were significant predictors, but the psychological factors influence was stronger on potential entrepreneurs, whereas the external environment was stronger for successful entrepreneurs (Taormina & Lao, 2007). Whereas the variable perceived importance of business environment was used in another study with other several variables. These indicators perceived importance of business environment, social status, and country external conflicts. They revealed that the perceived importance of business environment is the most important variable in predicting EM, while the perceived social status doesn't affect the motivation of an entrepreneur to start a new business (Abu Zayyad et al., 2020; Fereidouni et al., 2010).

A revision of other streams of existing studies concluded that the motivation of an individual is complicated and multi-faceted (Marlow & Strange, 1994; Shane et al., 1991) and relied moslty on push and pull theory. In particular, individuals who think they are able to create or to grow in a business are stronger and more motivated to create new venture and to develop in certain business successfully (Malebana, 2014). The push and pull indicators play a key role in EM, it helps in understanding why people decide to create a new venture. Pull indicators contain independence, achievement, personal growth and recognition, in contrast push indicators are lack of innovation and alternatives, insecurity of work and unemployment (Wickham, 2006). Individuals who depend on pull indicators perceive the entrepreneurial job opportunity more attractive, so they are considered as entrepreneurs, while others who depend on push indicators choose to follow entrepreneurship and decide to create new business just because the traditional work is less attractive (Malebana, 2014). Taking this point further, (Reynolds et al., 2002) suggested that individuals who are opportunity driven are more motivated to exploit opportunities for economic gain in order to achieve success, and those who are necessity driven are motivated just for the need of survival.

In conclusion, several indicators have been identified as determinants of EM within the EM literature and there was no agreement upon which theories most applicable to EM determinants and which are the most important indicators that affect EM. To address this gap in the entrepreneurship literature, the current study seeks to; firstly, present a theoretical model of the most important determinants of EM by incorporating variables synthesized from the EM and EI literature. Secondly, this study will empirically validate the model from the entrepreneurial perspective. The final result will be the development and empirical validation of a comprehensive model of determinants of EM and EI.

2.3 Research Model

Previous studies about EM have been examined, it is noted that most of the studies did not develop a comprehensive model to measure EM as the results showed that there are several indicators forming EM construct. In reviewing the existing relevant literature, several studies attempted to examine EM using various indicators separately such as; need for achievement (Antonioli et al., 2016; Begley & Boyd, 1987; Johnson, 1990; Lee, 1996; Nishantha, 2009; Rauch & Frese, 2000; Sethi & Saxena, 2006; Shane et al., 2003), need for affiliation (Lee, 1996; Sethi & Saxena, 2006), need for autonomy (Estay et al., 2013; Lee, 1996; McClelland, 1985; Oosterbeek et al., 2010; Sethi & Saxena, 2006) need for power (McClelland, 1985; Sethi & Saxena, 2006) attitude toward becoming an entrepreneur (Malebana, 2014; Solesvik, 2013; Segal et al., 2005; Ajzen, 2005; Fishbein, 1975; Linan 2004), subjective norms (Malebana, 2014; Segal et al., 2005; Solesvik, 2013) perceived behavioral Control (Malebana, 2014; Segal et al., 2005; Solesvik, 2013). Based on theory of planned behavior (Fishbein & Ajzen, 1975), creativity (Caird, 1991; Cromie & O'Donoghue 1992; Zhu et al., 2016), risk taking (Estay et al., 2013; Jayachandra, 2011; Koh, 1996; Nishantha, 2009; Segal et al., 2005) economic Core (Aziza et al., 2013; Vijaya, 1998) financial motive (Aziza et al., 2013; Hessels et al., 2008; Sarri & Trihopoulou, 2004) and governance (Audretsch, 2002; Stevenson & Lundström, 2001; OECD, 2010). Therefore, the current research proposed that all of these indicators may act as significant indictors to measure EM, as well as the impact of EM on EI (Liñán & Chen, 2009b).

The elements of this research are established based on preceding literature review either theoretically or empirically. Indeed, this study uses variables that are common Entrepreneurship Motivation and Entrepreneurial Intention literature. Figure 1 represents a model of the study that shows the independent variables (in which twelve indicators have been identified as the key indicators of EM as shown below in Fig. 1), the dependent variable and the proposed relationship between them.

2.3.1 Need for Achievement

Need for achievement is defined as an individual drive to exceed with respect to some settled arrangement of norms and standards (Lee, 1996; McClelland, 1985). Much of the literature have examined how entrepreneurs are motivated, by a higher need for achievement than employees (Lee, 1996; Nishantha, 2009; Oosterbeek et al., 2010; Sethi & Saxena, 2006). Taking this point further, individuals with higher need for achievement are more satisfied in jobs that have hard challenges and high skill levels (Eisenberger et al., 2005) and are more frequently demanded for a feedback on their advance towards goal fulfillment (Emmons, 1997; McAdams, 1994). Furthermore, individuals with high need for achievement are more likely to be motivated in order to become an entrepreneur (Antonioli et al., 2016; Lee, 1996; Nishantha, 2009). Therefore, based on the previous discussion this study supposed that, need for achievement is highly correlated for the higher-order construct EM.

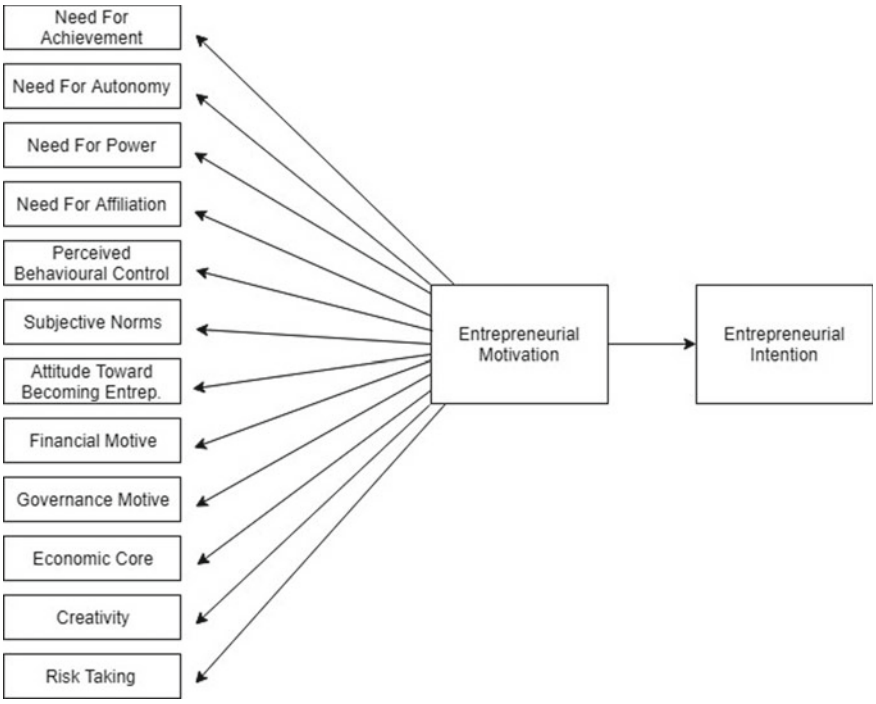

Fig. 1 Research model

2.3.2 Need for Affiliation

Need for affiliation is viewed as the desire to have warm, friendly relationships with others (Robbins, 2003; McClelland, 1985; Veroff, 1980). Several studies have applied need for affiliation in various fields such as entrepreneurship (Lee, 1996; Sethi & Saxena, 2006), and managemnet (Lee, 1996). Studies have shown that people with higher need for affiliation tend to be more successful managers and leaders (Lee, 1996). In addition to that, people with high need for affiliation were more likely to become an entrepreneur and it is highly correlated with EM (Lee, 1996; Sethi & Saxena, 2006). Therefore, this study supposed that need for affiliation is highly correlated for the higher-order construct EM.

2.3.3 Need for Autonomy

Need for autonomy is defined as a want for independence, (Sethi & Saxena, 2006) and to be able get things done without taking into consideration to what others may think and to avoid commitment and responsibility (Lee, 1996). Several studies indicated that individuals with high need for autonomy were more motivated to become an

entrepreneur and will influence EM (Estay et al., 2013; Lee, 1996; Sethi & Saxena, 2006). Therefore, this study supposed that need for autonomy is highly correlated for the higher-order construct EM.

2.3.4 Need for Power

Need for power is defined as individuals who look for position control that can constrain the activities of others (McClelland, 1985). In more recent studies, it was defined as the concern for affecting individuals or the conduct of others for moving in the direction that was chosen and achieving the envisioned goals (Sethi & Saxena, 2006). Much of the literature agreed that need for power is highly and positevely coorelated to EM (McClelland, 1985; Sethi & Saxena, 2006). Therefore, this study supposed that need for power is highly correlated for the higher-order construct EM.

2.3.5 Attitude Toward Becoming an Entrepreneur

Personal attitude defined as an individual's favorable or unfavorable estimation of a specific behavior (Ajzen, 2005), individuals evolve attitudes from the beliefs they hold about the results of performing the behavior (Malebana, 2014). In other studies, attitude characterized as the predisposition to reaction an unfavorable or favorable way with respect to the object of the attitude (Ajzen, 1982; Shaver, 1987; Rosenberg & Hovland, 1960). Taking this point further, attitude toward a particular object has been found to be positively correlated to motivation and behavioral intentions (Bauer et al., 2005). Attitudes have a great influence on EM (Fishbein & Ajzen, 1975, Linan, 2004; Malebana, 2014; Solesvik, 2013), for that reason we hypothesize that attitude is highly correlated for the higher-order construct EM.

2.3.6 Subjective Norms

Subjective norms refer to the perceived social compression to perform or not the behavior (Malebana, 2014). In other studies, subjective norms defined as the social pressure to implement the behavior being referred to, moreover subjective norms are a measure of social help of the behavior by significant others, for example, family, connections and other considered as role models and associates (Bauer et al., 2005; Segal et al., 2005; Yau & Ho, 2015). In reviewing the related literature, subjective norms were found to be positively related to student behavioral intention to use e-learning in their education (Park, 2009; Yau & Ho, 2015). Moving to the entrepreneurial context, it is found that subjective norms have a great influence on the intention to become an entrepreneur (Malebana, 2014; Segal et al., 2005; Solesvik, 2013), for that reason, we hypothesize that subjective norms are correlated for the higher-order construct EM.

2.3.7 Perceived Behavioral Control (PBC)

PBC refers to people's appraisals of how much they are able of performing a specific behavior (Chiou, 1998; Malebana, 2014; Segal et al., 2005). Several researches have examined attitude in many fields, for example, entrepreneurship context (Malebana, 2014; Solesvik, 2013) and behavioral intention (Ajzen, 2005). PBC will influence the behavior of intention when individuals possess the accurate resources and skills to implement it (Ajzen, 2005). In addition to that, PBC have a great influence on individual's intention to become entrepreneurs and start their own ventures thus it will influence EM (Malebana, 2014; Segal et al., 2005; Solesvik, 2013), For that reason we hypothesize that PBC is highly correlated for the higher-order construct EM.

2.3.8 Creativity

Creativity defined as evolving new methods instead of utilizing standard procedures (Estay et al., 2013). In other studies, creativity characterized as a method for seeing or doing things that described by familiarity; to create many ideas, adaptability; to shift point of view effectively, elaboration; to expand on others thoughts, and, originality; to imagine something new (Alvino, 1990; Cromie & O'Donoghue, 1992). Several researches have examined creativity in many fields such as management and marketing context (Caird, 1991; Cromie & O'Donoghue, 1992; Zhu et al., 2016) and entrepreneurship and technology (Estay et al., 2013). Creativity influences owner—managers higher than managers (Caird, 1991), moreover, creative entrepreneurs are more likely to be to create new ideas or developing existing ideas in order to create more value and to be more innovative (Cromie & O'Donoghue, 1992). Creativity was found to have a great influence on individuals to start their new ventures and become entrepreneurs (Estay et al., 2013; Jaillot, 2017). For that reason, we suppose that creativity is correlated for the higher-order construct EM.

2.3.9 Financial Motive

Financial motive is viewed as the desire to earn wealth (Brett et al., 1995; Doran et al., 1991; George & Brief, 1990). Several researches have examined financial motive in many fields, for example, in organizations (Burton, 2012) and in entrepreneurship (Aziza et al., 2013; Hessels et al., 2008; Sarri & Trihopoulou, 2004). Financial motive has a great influence on employees, in which employees who are compensated financially will be more motivated and their performance will be higher (Burton, 2012). Entrepreneurs begin their businesses in order to gain more money. In particular, financial motive is considered as one of the indicators of EM in order to become an entrepreneur and start a business (Aziza et al., 2013; Hessels et al., 2008; Sarri & Trihopoulou, 2004), and for that reason we suppose that financial motive is correlated for the higher-order construct EM.

2.3.10 Risk Taking

Risk taking is characterized as an individual tendency towards taking opportunities in uncertain decision-making contexts (Estay et al., 2013; March & Shapira, 1987; Nishantha, 2009). Several researches have studied risk taking in many fields, for example, management context (Crimmon & Wehrung, 1986; March & Shapira, 1987) and entrepreneurship (Estay et al., 2013; Jayachandra, 2011; Koh, 1996; Nishantha, 2009; Segal et al., 2005). It has been previously found that risk taking influences managers' willingness to take risks (Crimmon & Wehrung, 1986) in which they connect risk taking with the expectation of their work and it influences managers' decision making (Abuhashesh et al., 2019; March & Shapira, 1987). In particular, risk taking is considered as a trait to distinguish founders from non-founders (Abuhashesh et al., 2019). Risk taking is considered high for individuals and has an influence for individuals who are entrepreneurially inclined than non-entrepreneurially inclined (Koh, 1996). Individuals with high-risk taking have an influence toward entrepreneurship (Nishantha, 2009). Risk taking has an influence on EI, in addition to that, risk taking have a great influence on EM (Estay et al., 2013; Nishantha, 2009), and for that reason we suppose that risk taking is highly correlated for the higher-order construct EM.

2.3.11 Economic Motive

Economic motive is defined as the investigation of how people use knowledge to recognize resources and use these scarce resources to make, utilizing knowledge, and commodities and disseminate them among individuals (Ayers & Collinge, 2005; Khumalo, 2012; McConnell, 1969). Several researches have studied economic core, such as, entrepreneurship (Aziza et al., 2013; Vijaya, 1998) and economic development (Deaton, 2010). Based on these studies, it is noted that economic motive makes entrepreneurs more motivated when they feel independence and self-achievement (Vijaya, 1998). Furthermore, economic motive effects saving rates, in which saving rates are higher in rapidly developing and growing economies (Deaton, 2010). Economic motive considered as one of the indicators of EM (Aziza et al., 2013; Vijaya, 1998). Therefore, we hypothesize that economic motive is correlated for the higher-order construct EM.

2.3.12 Governance Motive

Governance is defined as the activity of political, economic and executive authority to deal with a country's affairs. It is the complex systems, procedures and establishments, through which citizens and groups express their interests, practice their legitimate rights and commitments, and arrange their differences (Lusaka, 2013). For the current research, governance is defined by Ha et al. (2016), as "the traditions and institutions by which authority in a country is exercised. This includes (1) the

process by which governments are selected, monitored and replaced; (2) the capacity of the government to effectively formulate and implement sound policies; and (3) the respect of citizens and the state for the institutions that govern economic and social interactions among them" (P. 517).

Many researches have studied governance in several contexts, such as, corporate governance (Albourini et al., 2020) and entrepreneurship (Aziza et al., 2013; Yalcin et al., 2008). Good corporate governance is a way to make market confidence and business integrity, which then will be basic for organizations that need access to value capital for long term venture (Albourini et al., 2020). Governance is considered as one of the indicators of EM (Aziza et al., 2013; Yalcin et al., 2008) suggested that specific government policies influence people's desire to be entrepreneurs. Bureaucracy, exaggerated taxation, and limited access to capital are considered as barriers to entrepreneurship. Alternatively, their study proposes that entrepreneurs' perception that business laws and regulations are ideal to begin and manage new businesses are positively related to entrepreneurial motives. Limited studies discussed the influence of governance on EM, so more knowledge is needed to examine such influence in the Jordanian context. Therefore, this research hypothesize that governance is highly correlated for the higher-order construct EM. Based on the previous literature, we have developed the following hypothesis.

H1: EM is a higher order construct that consist from twelve first order indicators (need for achievement, need for autonomy, need for affiliation, need for power, subjective norms, attitude toward becoming entrepreneur, PBC, governance motive, creativity, financial motive, economic core motive, and risk taking).

2.4 Entrepreneurial Motivation

EM is defined as the willingness and propensity to manipulate and control companies, thoughts and human beings as independently and rapidly as possible (Johnson, 1990). Several studies have discussed EM in the business context (Delmar & Wiklund, 2008), education context (Ferreira et al., 2007; Raposo et al., 2008) and entrepreneurship context (Achchuthan & Nimalathasan, 2013; Carsrud & Brännback, 2011; Ajzen, 2012; Malebana, 2014; Solesvik, 2013). Some researchers focused on the significance of entrepreneurship education in the advancement of the EM and EI. For instance, (Ferreira et al., 2007; Raposo & A. Pac¸o & J. Ferreira, 2008) asserted that education has the most significant impact on the tendency to be motivated to create a new business among students. (Delmar & Wiklund, 2008) found that EM impacts the growth of small business. On the other hand, a significant relationship was found between EI and EM (Achchuthan & Nimalathasan, 2013; Solesvik, 2013). Some researchers found that there is a link between entrepreneurial intentions, motivation and behavior, they showed that since intentions cannot transform immediately into action, then motivation is considered as link between EI and actions; motivation will translate an intention into real action (Carsrud & Brännback, 2011). While other

researchers have emphasized on examining and measuring EM using the Theory of Planned Behavior (Ajzen, 2012; Malebana, 2014). This theory suggested that an individual's intention to perform or not to perform an action is the most important determinant of action (Ajzen, 2012). In particular, (Malebana, 2014) found that EM is a significant link between EI and entrepreneurial action; hence, it is suggested that the theory of planned behavior should be utilized to explore the determinants of EM and EI. According to Solesvik (2013), his empirical result depending on the theory of planned behavior showed that the three variables (attitude toward entrepreneurs, subjective norms, and PBC) affect EM and they mediate the relationship between EM and EI. Therefore, EM will have a significance influence on EI: Based on the previous studies, we have developed the following hypothesis.

H2: EM has a significant positive influence on EI.

3 Methodology

3.1 Population and Sample of the Study

The aim of this study to develop and validate a newly constructed model related to the EM construct and its impact on EI in Jordan. This research utilized the survey questionnaire as the fundamental method for gathering information. Online self-administered questionnaires were created based on prior literature. As this research is considering the indicators of EM that influences EI. The population of the research comprises entrepreneurs running their businesses in Jordan. Therefore, it is important for individuals who aim to start a business in Jordan to understand the indicators of EM that will influence their decision to run a business. The current study adopted a non-probability sampling procedure in which a convenience sampling technique is used. Thus, convenience sampling is incorporated into the research, 221 surveys were completed. The data was collected with support from the business incubators which operates in Jordan (Zinc, Oasis 500, The tank, Adamtec VC, QRCE, Business development center, Business and professional women, Shaml start, Migretmena, Big, I park, Injaz, Intaj).

The survey composed of two parts; the first part is information about demographics characteristics, which include gender, age, level of education, size of the company and legal form. The second part consists of EM indicators: need for achievement, (Culp, 2015) need for Affiliation (Culp, 2015) need for power (Lee, 1996), need for autonomy (Broeck et al., 2010), PBC (Malebana, 2014) subjective norms (Malebana, 2014) attitude toward becoming an entrepreneur (Malebana, 2014), governance motive (Ahmed et al., 2021), economic motive (Ahmed et al., 2021), financial motive (Ahmed et al., 2021), risk taking (Perry, 2014), creativity (Ala'eddin Ahmed et al., 2021), and EI (Liñán & Chen, 2009b). The measures in the questionnaire were based on prior studies and used the five-point Likert scale, the extent from "1" for strongly

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disagree to "5" for strongly agree (Farhangmehr et al., 2016), The survey questions were pre-tested by 30 entrepreneurs and ten university professors to take their feedback. The order of some questions after the feedback were reorganized, the content and wording of some questions were changed, furthermore some questions were complex, so rewording has been done in order to make them easier to be understood. Based on their review, some questions were deleted.

4 Data Analysis

The research model was tested a structural equation modeling via AMOS. The reason for using AMOS is that the study model contains a high order construct that consists of first order indicators which makes AMOS as the most appropriate statistical technique to test the model.

4.1 Reliability Analysis

Cronbach alpha (α) was used to assess the reliability of each scale (Hair, 1995). Table 1 shows that the Cronbach alpha of the items of each scale was above the threshold of 0.35 and the Cronbach alpha of each construct was above the threshold of 0.70.

4.2 Model Validation

It should be noted that AMOS 23 was used to assess convergent validity and discriminant validity. To do so, a model of 12 first-order correlated variables was specified. However, two of the 12 variables namely (economic motive and governance motive) did not correlate with other ten variables, which indicate that they are not part of the construct of entrepreneurial motivation. Therefore, these two variables were omitted from the model. Their inclusion actually produced a bad model-fit: CMIN/DF (3.248), IFI (0.701), TLI (0.627), CFI (0.692) and NFI (0.619). However, after deleting the two variables, the model fit has become as follows: CMIN/DF (2.357), IFI (0.878), TLI (0.824), CFI (0.864) and NFI (0.848), which is within the acceptable range (see Table 2).

4.3 Convergent and Discriminant Validities

Average variance extracted (AVE) was calculated in order to assess the convergent validity of each scale. Table 3 shows that the values of the AVE of each scale was

Table 1 Construct reliability

Construct	Cronbach alpha
Need for achievement	0.848
Need for affiliation	0.844
Need for power	0.85
Need for autonomy	0.847
PBC	0.844
Subjective norms	0.845
Creativity	0.847
Risk taking	0.847
Financial motive	0.843
Economic core	0.851
Attitude toward becoming entrepreneur	0.844
Governance motive	0.849
Entrepreneurial intention	0.843

Table 2 Rule of thumbs of goodness-fit-indices

Type of fit indices	Cut-off point
CMIN (X^2)	p-value $\geq$ 0.05
Normed CMIN (CMIN/DF)	1.0 < CMIN/DF < 3.0
Normed Fit Index (NFI)	0.8 < NFI < 0.9 (acceptable fit)
	0.9 $\leq$ NFI > 1 (satisfactory fit)
	NFI = 1 (perfect fit)
Competitive Fit Index (CFI)	0.8 < CFI < 0.9 (acceptable fit)
	0.9 $\leq$ CFI > 1 (satisfactory fit)
	CFI = 1 (perfect fit)
Tucker-Lewis Index (TLI)	0.8 < TLI < 0.9 (acceptable fit)
	0.9 $\leq$ TLI > 1 (satisfactory fit)
	TLI = 1 (perfect fit)
Incremental Fit Index (IFI)	0.8 < IFI < 0.9 (acceptable fit)
	0.9 $\leq$ IFI > 1 (satisfactory fit)
	IFI = 1 (perfect fit)

above than the cut-off-point of 0.50. Discriminant validity is characterized as two variables, which are not, correlated with each other the items that measures each variable is poorly correlated with each other in the same model.

Table 3 Convergent validity and discriminant validity

	AVE	Financial motive	Need for affiliation	Need for achievement	Need for autonomy	Creativity	Power	Subject norms	PBC	Risk taking	Attitude	Entrepreneurial intention
Financial Motive	0.63	**0.794**										
Affiliation	0.585	0.284	**0.765**									
Achievement	0.534	0.465	0.573	**0.731**								
Autonomy	0.671	0.458	0.522	0.67	**0.819**							
Creativity	0.528	0.407	0.594	0.703	0.579	**0.726**						
Power	0.618	0.495	0.495	0.484	0.408	0.46	**0.786**					
Subject norm	0.567	0.423	0.472	0.482	0.448	0.595	0.529	**0.753**				
Perceived behavioral control	0.532	0.598	0.524	0.481	0.541	0.681	0.559	0.491	**0.729**			
Risk taking	0.628	0.434	0.515	0.548	0.62	0.534	0.565	0.412	0.588	**0.793**		
Attitude	0.605	0.504	0.564	0.514	0.443	0.581	0.468	0.52	0.615	0.589	**0.778**	
Entrepreneurial intention	0.564	0.492	0.552	0.502	0.431	0.569	0.456	0.508	0.603	0.577	0.517	**0.751**

4.4 Model Testing

AMOS 23 was also used to test the thesis's hypotheses. To do so, a high order construct of entrepreneurial motivation that consists of ten first-order indicators was specified. The results of the hypotheses are reported below.

H1: EM is a high order construct that consist from twelve first order indicators (Need for achievement, Need for Autonomy, Need for Affiliation, need for power, Subjective norms, Attitude, perceived behavioral control, Governance, creativity, financial motive, Economic core, and Risk Taking).

This hypothesis was rejected as economic core motive and governance motive were deleted, which indicates the EM is a high order construct that consists of ten rather than twelve first order variables. These variables are Need for achievement, need for autonomy, need for affiliation, need for power, Subjective norms, Attitude, PBC, Creativity, Financial motive, and Risk taking.

The fit indices of this model are as follows: CMIN/DF (2.357), IFI (0.878), TLI (0.824) and CFI (0.864). Table 4 also shows the relative importance of each of variables in forming the construct of EM. All the variables were significant at (0.001), (***).

H2: EM is positively associated with EI.

This hypothesis is accepted ($\beta = 0.743$, $p < 0.001$). Additionally, the variance in EI that was explained by entrepreneurial motivation was substantial ($R^2 = 0.745$), All the results are reported in Table 5.

Table 4 Regression weights of each indicator

			Regression weights
Financial motive	←	EM	0.912
Need for affiliation	←	EM	0.436
Need for achievement	←	EM	0.49
Need for autonomy	←	EM	0.449
Creativity	←	EM	0.337
Need For power	←	EM	0.596
Subjective norms	←	EM	0.48
Perceived behavioral control	←	EM	0.838
Risk taking	←	EM	0.758
Attitude toward becoming entrepreneur	←	EM	0.716

Table 5 Regression weights of each indicator with EI

			Regression weights
Financial motive	←	EM	0.912
Need for affiliation	←	EM	0.436
Need for achievement	←	EM	0.49
Need for autonomy	←	EM	0.449
Creativity	←	EM	0.337
Need For power	←	EM	0.596
Subjective norms	←	EM	0.48
Perceived behavioral control	←	EM	0.838
Risk taking	←	EM	0.758
Attitude toward becoming entrepreneur	←	EM	0.716
Entrepreneurial intention	←	EM	0.743

5 Discussion and Conclusion

5.1 Discussion

The analysis results showed a strong evidence for the current research model. In particular, the research proposed that EM is a higher order construct, that consists from twelve first order indicators (need for achievement, need for autonomy, need for affiliation, need for power, subjective norms, attitude, PBC, governance, creativity, financial motive, economic core, and risk taking). The results of the data analysis showed that there is a correlation with the high order construct by these indicators in a descending order as follows; financial motive ($\beta = 0.912$); PBC ($\beta = 0.838$); risk taking ($\beta = 0.758$); attitude toward becoming entrepreneur ($\beta = 0.716$); need for power ($\beta = 0.\ 596$); need for achievement ($\beta = 0.490$); subjective norms ($\beta = 0.480$); need for autonomy ($\beta = 0.449$); need for affiliation ($\beta = 0.436$); creativity ($\beta = 0.337$), With a significance level of 0.000.

Concerning McClelland needs theory which consists of need for achievement, need for affiliation, need for autonomy and need for power, the current research added a significant contribution for the existing literature by enhancing our knowledge about the EM indicators. Some researchers found that entrepreneurs with high need for achievement are motivated more than employees (Lee, 1996; Nishantha, 2009; Oosterbeek et al., 2010; Sethi & Saxena, 2006). While according to Eisenberger et al. (2005) who indicated that individuals with higher need for achievement are more satisfied in jobs that have hard challenges and high skill levels. As well as need for affiliation, (Lee, 1996) found that people with need for affiliation tend to be more successful managers and helpers. As well as, need for affiliation has a significant influence onorganizational identification. Researchesrs found that individuals with need for autonomy are highly motivated to start a new ventures (Estay et al., 2013).

While people with high need for power influenced EM. However, people with high need for achievement, need for affiliation, need for autonomy and need for power influenced the decision to be an entrepreneur as well as EM (Antonioli et al., 2016; Lee, 1996; Nishantha, 2009; Sethi & Saxena, 2006; Shane et al., 2003). The results of the current research data analysis are consistent with prior researches in which McClelland Needs Theory variables considered as indicators of EM.

With regard to theory of planned behavior which consists of attitude toward becoming entrepreneur, subjective norms, and PBC, the current research found that variables related to this theory are considered as significant indicator of EM, which is consistent with the finding of Malebana (2014), Solesvik (2013), Segal et al. (2005), Fishbein and Ajzen (1975), Linan (2004) in which they found that the theory of planned behavior affects the EM. For Malebana (2014), found attitude toward becoming entrepreneur is significantly influenced EM. While according to Bauer et al. (2005), found attitude toward becoming an entrepreneur influenced the motivation and behavioral intentions. As well as, some studies found subjective norms as an influencer toward student behavioral intention towards e learning to be used in their education (Park, 2009; Yau & Ho, 2015). Others found that subjective norms affected the intention to become an entrepreneur (Malebana, 2014; Segal et al., 2005; Solesvik, 2013). In addition to that, (Ajzen, 2005) found that PBC influenced the behavioral intention when individuals possess the accurate resources and skills to implement it (Ajzen, 2005). While others found that PBC influenced the intention of individuals to be entrepreneurs in order to start their own ventures (Malebana, 2014; Segal et al., 2005; Solesvik, 2013).

The findings of this research showed that creativity is a significant indicator in EM, which is consistent with prior studies. For example, creativity has higher influence on managers (Caird, 1991). While according to Cromie and O'Donoghue (1992), found that creativity influenced entrepreneurs in order to create new ideas or develop existing ideas for creating more value and to be more innovative. Others found that creativity influenced individuals to start new ventures and become entrepreneurs (Estay et al., 2013; Jaillot, 2017). For Zhu et al. (2016) found that creativity is a significant influencer on EM. Based on the previous discussion, the current research is consistent with prior studies and it enhanced our knowledge by determining creativity as a significant indicator in EM in the Jordanian context.

Regarding financial motive, previous studies found an influence of financial motive on EM, for Burton (2012), found that financial motive have a great influence on employees, in particularly, employees who are compensated financially are more motivated and their performance are higher. Whereas others found that entrepreneurs begin their businesses to gain more money, in which they found that financial motive is considered as one of EM indicators that influenced individuals to become entrepreneurs and start new business (Aziza et al., 2013; Hessels et al., 2008; Sarri & Trihopoulou, 2004). For the current research it was found that financial motive is the most highly correlated indicator for the higher-order construct EM, this result was consistent with the previous discussed studies.

Concerning risk taking, for Crimmon and Wehrung (1986) found that risk taking influenced managers' willingness to take risks. Moreover, March and Shapira (1987)

found that risk taking is connected to the work expectations as well as, risk taking influenced the decision making of managers. Whereas, Nishantha (2009) found individuals that have high risk-taking influenced entrepreneurship. In addition, others found that risk taking have influenced the intention to become an entrepreneur and have influenced EM too (Estay et al., 2013; Nishantha, 2009). For the current research, it was found that risk taking as an indicator has a significant correlation towards EM in the Jordanian context, which was consistent with the previous literatures.

Regarding governance, previous studies found that governance in corporation influenced the confidence of the market and business integrity, in which governance is a basic need for organizations that need access to value capital for long-term venture (Albourini et al., 2020). Whereas, (Yalcin et al., 2008) found that specific government policies influenced people's desire to be entrepreneurs, they found that bureaucracy and limited access to capital are barriers to entrepreneurship, as well as they also found that business laws and regulations are ideal to begin and manage new businesses for entrepreneurs thus entrepreneurs are highly motivated. While according to Aziza et al. (2013), they found that governance influence EM. However, it is noteworthy to mention that limited studies have been done to the best of our knowledge, about governance and its correlation with EM. For the current research, it was found that there's an insignificant correlation with other 10 variables, which indicate that it is not part of the construct of EM in the Jordanian context. This result was inconsistent with the previous discussed studies. However, it should be noted that the current research was conducted in Jordan, while previous studies performed their studies in different countries, such as in China (Cullen et al., 2014) and in the Kingdom of Saudi Arabia (Salem, 2014).

Concerning economic core motive, (Deaton, 2010) found that economic core effects saving rates that are higher in rapidly developing and growing economies. According to Vijaya (1998), found that economic motive makes entrepreneurs more motivated when they feel independence and self-achievement. Economic core is one of the indicators of EM (Aziza et al., 2013; Vijaya, 1998). The current research found that economic motive did not correlate with other 10 variables, which indicate that it is not part of the construct of EM in the Jordanian context. However, Limited studies have been done to the best of our knowledge, about economic influence on EM. The result of this research is inconsistent with the previous studies. However, it should be noted that this research was conducted in Jordan, while previous studies performed their studies in Malaysia (Obaji, 2014) and in Nigeria (Oni, 2012).

Concerning the key findings of the higher order construct EM and its impact on EI, the standardized coefficients ($\beta = 0.743$), as well as, ($R^2 = 0.729$) and ($p < 0.001$). This research added a significant contribution for the existing literature by enhancing our knowledge about the influence of EM on EI. Some researchers found that entrepreneurship education have a great influence in the advancement of EM and EI, in which they discovered that education influenced students towards becoming motivated and creating new business (Ferreira et al., 2007; Raposo et al., 2008). According to Delmar and Wiklund (2008), found that EM impacts the growth of small

business. On the other hand, some researchers found a significant positively relationship between EI and EM (Achchuthan & Nimalathasan, 2013; Solesvik, 2013). Whereas, others found that there is a link between EIs, motivation and behavior, they showed that since intentions cannot transform immediately into action, then motivation is linked between EI and actions; motivation translated an intention into real action (Carsrud & Brännback, 2011). While other researchers have found that, an individual's intention to perform or not to perform an action is the most important determinant of action (Ajzen, 2012). In particular, (Malebana, 2014) found that EM connects EI and entrepreneurial action. According to Solesvik (2013), his empirical result showed that theory of planned behavior influence and it mediates the relationship between EM and EI. The results of the current research are consistent with previous literature, which showed that there is a great significance influence of EM on EI.

5.2 Theoretical Implications

The current research attempted to fill the gap in the literature, as well as, to develop a comprehensive model to measure EM and its impact on EI, also to detect the indicators of EM and to recognize its effect on EI. Previous studies have concentrated on a specific theories or variables in developing their model, while the current research has concentrated on developing a comprehensive model. The model consists of twelve indicators to measure EM, from a different previous studies, using theories and key variables, the current research used McClelland Needs theory (need for achievement, need for affiliation, need for autonomy, need for power), theory of planned behavior (PBC, subjective norms, attitude toward becoming entrepreneur) and key variables such as: financial motive, governance motive, economic motive, creativity and risk taking, in addition to that, the current study enhanced the understanding of EM construct through using rigorous statistical techniques. The developed model can be applied in other countries. This research aimed to provide better understanding related to the indicators of EM and its influence on EI.

5.3 Implications for Asian Business Contexts

The value of this research regarding entrepreneurship context can be applied in practice. It can be applied by schools and universities by developing for students an educational material for each indicator and provide them with training courses, or to make a mandatory course for them, thus, will lead to increase the number of entrepreneurs in the future. Furthermore, governance and economic motives are considered as entrepreneurial motivators in other countries, but when we implement the scale in the Jordanian context we found that they are not correlated to EM for Jordanian entrepreneurs, thus, these results suggest the need for Jordanian policy

makers, planners and economist to consider additional methods to improve governance motive (i.e., policies and regulations needed to run a business), and improve the economic motive (i.e., taxation, material cost and interest rate). In addition to that, Jordanian government can create favorable business laws, offer tax reductions to entrepreneurs, support entrepreneurs and be willing to give government loans.

5.4 Limitation

A number of limitations were found within this research, the research was conducted only in the Jordanian context, as well as this research was influenced by money and time constraints. Furthermore, it was not easy to access the business incubators, and it was difficult to differentiate between entrepreneurs and SMEs owner. As well as, this research found lack of interest for entrepreneurs in the scientific researches.

5.5 Future Studies

The current study examined the EM indicators and its impact on EI in the Jordanian context, for future researchers can examine the same model in other countries to see how entrepreneurs from different regions perceive the dimensions of EM and it impact on EI. In addition to that, mixed methodology can be used in future studies including quantitative and qualitative together such as focus groups or interviews, to further elaborate on key issues of such topic.

5.6 Conclusion

This research aims to examine the factors that considered as indicators of EM and the effect of EM on EI in a comprehensive model, based on previous studies, there was no comprehensive model used to measure EM. This current research contribution is to fill this gap in the literature, finding comprehensive model to measure EM and its impact on EI, Understanding EM indicators and their effect on EI, can be helpful for entrepreneurs and their SME's because it might influence the increase of percentage of succesfull businesess (Stefanovic et al., 2010).

The developed model for the current research included EM which is a high order construct that consists from twelve first order indicators (need for achievement, need for autonomy, need for affiliation, need for power, subjective norms, attitude toward becoming entrepreneur, PBC, governance, financial motive, economic core, creativity, and risk taking) and considered EM as an independent variable for the dependent variable EI.

A quantitative approach was used in this research; data were administrated via an online and face-to-face survey. Survey was filled by entrepreneurs in Jordan; the data were tested using a structural equation modeling via AMOS. The findings of this research showed that need for achievement, need for autonomy, need for affiliation, need for power, subjective norms, attitude toward becoming entrepreneur, PBC, financial motive, creativity, and risk taking are considered as indicators for EM, whereas, governance and economic core is not considered as indicators for EM in the Jordanian context. Furthermore, the research found that EM is a highly significant influencer of EI.

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Exploring the Relationship Between Open Innovation, Procurement Sustainability and Organisational Performance: The Mediating Role of Procurement Agility

Nawaf Al Awadhi and Muhammad Turki Alshurideh

1 Introduction

Open innovation concept within the highly dynamic global socio-economic environment is based on the idea that corporate entities should take advantage of the various external and internal ideas for doing things differently in an organization (Almaazmi et al., 2020; Nuseir et al., 2021). Open innovation in this context should be understood to mean the utilization of combination of knowledge outflows and attendant inflows, to accelerate internal innovation while at the same time expanding opportunities for external utilization of innovation (Al Suwaidi et al., 2020; Alameeri et al., 2021). A robust open innovation model for any enterprise within the global socio-economic and political landscape should be rather strategic in managing the exchange of valuable information with is irrelevant to the boundaries of classic organizations (Alzoubi et al., 2022; Ghannajeh et al., 2015). Such exchange of information is critical to the growth of an enterprise, particularly because it is aimed at influencing and integrating individual corporate resources and related knowledge into the internal channels of an organization's innovative processes (Al Naqbi et al., 2020; Obeidat et al., 2021). In order to critically analyze the concept of open innovation in the modern business environment, it would be important to analyze how such an idea helps improve growth of typical enterprises (AlMehrzi et al., 2020; Odeh et al., 2021). Such an analysis would regularly span a discussion on the different mediators in the link between open

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_87

innovation and organizational performance. Of specific and extreme importance in the following discussion is an analysis on whether the concept of procurement agility is explored in any possible research as a critical mediating factor in exploring the relationship between open innovation, procurement sustainability and organizational performance. The two questions the research will attempt to answer are:

Q1: Does open innovation impact the achievement of procurement sustainability and effect organizational performance?

Q2: What is the influence of procurement sustainability on organizational performance?

2 Research Variables and Methodology

The following study will adopt a qualitative research methodology, primarily through exploration of the relevant literature on the link between open innovation and organization growth, while also taking into account the various possible mediating factor like procurement agility. A qualitative research study in this context involves the ability of a researcher to pursue an in-depth and deeper exploring of various factors affecting a phenomenon trough adopting a specific and focused line of questioning. By focusing through the available literature on the connection between open innovation and organization growth, the research study is prepared to gather evidence that will prove the existence of such a relationship or otherwise.

The key research variables in the ensuing research study include, organizational performance, procurement sustainability and the concept of open innovation. Other variables that will suffice in the research study will largely span the different mediating factors in the relationship between open innovation and firm growth with the modern global business environment. Open innovation as a key variable in the research study has been dissected by researchers such as Parveen et al. (2015) who averred that the use of invention and technology creates value and plays a major role in enhancing social well-being. Other authors such as Islam et al. (2017) argued that the concept of open innovation presumes that corporates apply an open system that is based on internal and external factors. The variable is termed as a distributed process founded on purposeful managed information that flows across institutions using non-pecuniary and pecuniary mechanisms (Parveen et al., 2015). **Open innovation** is defined as an approach for organizations to achieve sustainable growth. The second variable examined in the current research is **procurement sustainability**. The rise trend and incorporation of tenders within institutions has enhanced the need to achieve sustainable approaches in procurement methods. Markedly, the capacity to meet the requirements is founded on the level of innovation used to promote the process. Openness, accountability, and timing are critical factors while assessing the sustainability of the procurement process. As organizations strive to achieve their set future objectives, procurement plays a significant role in determining how they attain consistent growth (Starzyńska, 2019). The procurement process serves as a factor

facilitating innovation diffusion to reduce the risks of losses and exit from markets. The research defines procurement sustainability is the level where institutions incorporate environmental and social factors alongside the financial aspects of acquiring goods or services (Blind et al., 2020). It is therefore, an essential part of a business that ensures enhanced performance.

Organizational performance is the third variable examined in the report. According to Sethibe and Steyn (2016), it is an aspect measured in the operational and financial sustainability of a firm. The measures of institutional performance depend on the related question and correlate to the independent variables. In this report, organizational performance relies on the adoption of open innovation in procurement processes and the achievement of sustainability in the overall procedures. Therefore, it is a critical element within the institution that defines the success in business functions but relies on different factors. Also, Hameed (2018) investigated the main drivers of an archetypal firm's open innovation performance om small and medium entreprises in Malaysia. The study found that a decline in open innovation practices in Malaysian firms the potential to hamper overall performance. The study suggested a raft of measures designed to correct the anomaly through a cross-sectional study fo Malaysina firms. The research adopted a quantitative research design, and the subsequent research results collated using a 5-point likert scale from mail surveys. The study listed internal innovation, Research and Development (R&D), and external knowledge as critical determinant's of a typical enterprsise's open innovation performance. Moreover, Asha (2008) dissected the issue the impact of various styles of open innovation and sectorl organizational performance. The study found tow critical variables linked to the construct of open innovation that includes, an understanding of open styles innovation by firms, and the question as to whether the ability of a firm to discern open innovation design capabilities has a bearing on individual corporation's performance. The research study was largely distinctive particuallry because of its design and attendant conceptualization. The research tested the hypothesis from a vast cros-sectional data of 16,445 businesses across the United Kingdom, derived from the UK innovation suvey database. The study found that design capability is an important construct of open innovation practices, and thus managers should give it greater attention.

Stanisławski (2020) conducted a study on open innovation as a value chain for small and medium enterprises. The study mainly focused on the various determinants of the use of open innovation for firms in Poland. The study identified both internal and external determinats of open innovation. In this regard, the study found that larger entities are more poised to use open innovation than comparatively smaller entities. The study further asserted that both external and internal determinants of open innovation have a significant impact on the general application of open innovation concepts in companies across Poland. Also, Canh et al. (2019) conducted a study on the general impact of open innovation on firm performance and corporate social responbilities for firms across Vietnam. The study focused on individual and process innovation, and the manner in which such costructs interact with an entitys internal collaborations, and the attendant impact on corporate social responsibility and firm performance. The findinsg of the study were that consistent investments in open

innovation by entities have the potential to enhance firm performance. To add more, Durst and Ståhle (2014) conducted a study on the various critical success factors of open innovation. Through a systematic review of 29 studies on open innovation, the study identified a total of 9 themes deemed to be critical to the success of open innovation in manufacturing entities. Such themes include; provision of resources, leadership, culture, governance, relational aspects, strategy, process management, and the pepple involved in open innovation processes.

3 Review Approach

The current report uses a systematic review to assess and examine the relationship between open innovation, sustainable procurement, and organizational performance. The approach identifies, chooses, and critically appraises various researches as an approach to answer the formulated questions (Perényi & Losoncz, 2018; Al Mehrez et al., 2020; AlShehhi et al., 2020; Ahmad et al., 2021). According to Cooper et al. (2018), a systematic review incorporates searching studies to undertake a transparent report. It leaves a straightforward approach about how the studies were identified and how the researcher arrived at the findings in relevance to the research questions (Ahmed et al., 2020; Alkitbi et al., 2020; Alshamsi et al., 2020). The major advantage of using a systematic review in this report is to enhance reliability and transparency on the research findings in relation to how the variables correlate to each other (Al Khayyal et al., 2020; Almazrouei et al., 2020). The study focused on 35 articles that consisted the literature review. Out of the 35 articles that comprised the study, a total of 19 articles qualified for an indepth analysis. The initial article searches in the entire research study was more than 40,000 articles. Subsequently, the universe of the research article searches related to the study was cut down to 35 articles. A total of 16 articles were related to innovation, while 19 articles were related to procurement.

4 Main Finding Table

Articles	Related to innovation	Related to procurement	Total
Number	16	19	35
Variables	Open innovaition	Procurement sustainability	Procurement agility
	16	16	3
Dabase	Number of articles related to open innovation	Number of articles related to procurement sustainability	Number of articles related to procurement agility
Pro quest	7	4	2
Initial search	8,279	79	3
Google scholar	9	12	1
Initial search	37,000	497	30

S.No	Title	Authors	Year	Place	Context	Independent variable	Mediating variable	Depend variable	Data collection methods	Sample size	Journal title	Findings/main aspects	Limitations	Future study
1	Revitalizing the concept of Public Procurement for Innovation (PPI) from a systemic perspective: objectives, policy types, and impact mechanisms	Shin, Kiyoon, Yeongjun Yeo, and Jeong-Dong Lee	2019	Korea	Public sector	Innovativeness	Policies	Procurement efficiency	Qualitative	N/A	Systemic practice and action research	Innovativeness in procurement is critical for efficiency and transparency	The research fails to provide a suitable policy implication	Future studies need to focus on economic variables
2	Innovation and standardization as drivers of companies' success in public procurement: an empirical analysis	Blind, Knut, Jakob Pohlisch, and Anne Rainville	2020	N/A	Public sector	Innovation	Standardization	Procurement success	Qualitative	N/A	The journal of technology transfer	Innovation influencing procurement outcomes by enhancing efficiency and transparency	Possibility of endogeneity	There are no future recommendations

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S.No	Title	Authors	Year	Place	Context	Independent variable	Mediating variable	Depend variable	Data collection methods	Sample size	Journal title	Findings/main aspects	Limitations	Future study
3	The benefits and challenges of E-procurement implementation: a case study of Malaysian company	Mohd Nasrun Mohd Nawi1*, Saniah Roslan2, Nurul Azita Salleh3, Faisal Zulhumadi4, and Aizul Nahar Harun5	2016	Malaysia	Telecommunication industry	E-procurement adoption	N/A	Institution's performance	Qualitative case study	N/A	International journal of economics and financial issues	Adoption of e-procurement has eminent benefits, which include saving cost and enhancing efficiency in the procurement process. innovation is a recent development that lacks benchmarking	The study considered one institution as a case, which limits the generalizability of the findings	There are no recommendations for future studies
4	Measuring the link between public procurement and innovation	Appelt, Silvia, and Fernando Galindo-Rueda	2016	Multi-country	OECD project	Innovation	N/A	Procurement	Qualitative	N/A	OECD science technology and industry working papers	Innovation plays a major role in enhancing the procurement process	There are no limitations to the study	There are no future recommendations given

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S.No	Title	Authors	Year	Place	Context	Independent variable	Mediating variable	Depend variable	Data collection methods	Sample size	Journal title	Findings/main aspects	Limitations	Future study
5	Public procurement for innovation and civil preparedness: a policy-practice gap	Isabell Therese Storsjö and Hlekiwe Kachali	2017	Finland	Healthcare sector	Policies relating to Innovation and civil preparedness	N/A	Procurement effectiveness	Quantitative	92	International journal of public sector management	Policies guide the process of innovation in the procurement process, which enhance the ability to achieve sustainable development	The data collected were for the Finland health sector	The future direction is to map supply networks and establish points that require innovation as an approach to enhance the effectiveness
6	Sustainable innovation in public procurement: The decisive role of the individual	Martin E. Eikelboom	2018	N/A	Large public institutions	Individual initiative	N/A	Sustainable innovativeness	Quantitative	283	Journal of public procurement	From the study, innovation is critical in enhancing sustainable innovations	The study was conducted within one institution	Future research should expand on the model and assess the various connections between the constructs
7	The effect of innovation capability on business performance: a focus on IT and business service companies	Seung Hoo Jin and Sang Ok Choi	2019	Korea	IT sector	Innovation capability	N/A	Business performance	Quantitative	160	Sustainability basel	Innovation plays a major role in enhancing sustainability within firms, which include procurement processes	The results are analyzed based on productivity and revenue	

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S.No	Title	Authors	Year	Place	Context	Independent variable	Mediating variable	Depend variable	Data collection methods	Sample size	Journal title	Findings/main aspects	Limitations	Future study
8	Public procurement as a policy tool: using procurement to reach desired outcomes in society	Grandia, Jolien, and Joanne Meehan	2017	Europe	Sectors of the economy	Innovation	N/A	Procurement performance	Qualitative	N/A	International journal of public sector management	Procurement procedures are supported through advancements in technology	N/A	N/A
9	A field-level examination of the adoption of sustainable procurement in the social housing sector	Meehan, Joanne, and David J. Bryde	2015	N/A	Social housing sector	Sustainable procurement	N/A	Institution performance	Quantitative	116	International journal of operations and production management	Provisions for sustainable procurement processes enable firms to achieve high performance	The findings give an insight into the research topic	Longitudinal studies need to be undertaken across different countries
10	Modeling the adoption of sustainable procurement in construction organizations	Agbesi, Kwaku, Frank D. Fugar, and Theophilus Adjei-Kumi	2018	N/A	Construction sector	Sustainable procurement	N/A	Institutional performance	Quantitative	193	Built environment project and asset management	To attain consistent growth, institutions need to adopt sustainable procurement as a vessel to incorporate innovation	The study is limited in scope	Future research should enhance the scope of the topic

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S.No	Title	Authors	Year	Place	Context	Independent variable	Mediating variable	Depend variable	Data collection methods	Sample size	Journal title	Findings/main aspects	Limitations	Future study
11	Key factors hindering sustainable procurement in the Brazilian public sector: A Delphi study	Da Costa, Bruno BF, and Ana Lúcia TS Da Motta	2019	Brazil	Public sector	Sustainable procurement	External and internal factors	Organizational performance	Qualitative	N/A	International journal of sustainable development and planning	Sustainable procurement within the public sector enhances accountability and improved performance	The findings focus on the Brazilian public sector	Future studies could test the applicability of results in underdeveloped countries
12	**Cite**Eriksson, Per Erik. "Procurement strategies for enhancing exploration and exploitation in construction projects	Eriksson, Per Erik	2017	N/A	Construction industry	Procurement strategies	N/A	Exploitation of projects	Qualitative	N/A	Journal of financial management of property and construction	Procurement strategies enhance the management and implementation of projects	The article focuses on the construction sector	Future studies need to focus on diverse industries to enhance generalizability
13	E-Procurement adoption: A case study about the role of two Italian advisory services	Belisari, Sara, Daniele Binci, and Andrea Appolloni	2020	Italy	Legal sector	Innovation adoption	N/A	Achievement if sustainable procurement processes	Quantitative	51 contracting authorities	*Sustainability basel*	The study found that adoption of innovaton is critical to frm's sustainablity	The study was inconclusive due to inadequate literature	Future studies should explore recent literatures

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S.No	Title	Authors	Year	Place	Context	Independent variable	Mediating variable	Depend variable	Data collection methods	Sample size	Journal title	Findings/main aspects	Limitations	Future study
14	factors influencing the digitization of procurement and supply chains	Bien-haus,Florian., Haddud, Abu	2018	UK	Supply Chain	Procurement and supply chain	N/A	Digitaiztion factors in procurement	Quantita-tive	30	*Business Process Management Journal*	The study found that digitization is critical to development of procurement in an typical firms	The study was not broad in terms of coverage of firms in the UK	Future studies should focus on technology as a mediating factor
15	Innovation and standardization as drivers of companies' success in public procurement: an empirical analysis	Knu Blid,Jacob Pohlisch,Anne Rainville	2019	Poland	Procurement	innovation	N/A	Innovative factors	Qualita-tive	N/A	*The Journal of Technology Transfer volume*	Innovation plays a major role in enhancing sustainability within firms, which include procurement processes	The study covered a narrow view of the topic	Future studies should focus on bootlenecks that hinder innovation in the public sector
16	Defining the process to literature searching in systematic reviews: A literature review of guidance and supporting studies	Chris Cooper, Andrew Booth,Jo Varley-campbell, Nicky Britten,Ruth Garside	2018	UK	Systematic reviews	Innovation	N/A	N/A	Qualita-tive	N/A	*BMC medical research methodology*	The study found that systematic review of literarure is critical to understanding open innovation	The study was limited in terms of scope	Future studies should focus on wide range of recent literature on the topic

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S.No	Title	Authors	Year	Place	Context	Independent variable	Mediating variable	Depend variable	Data collection methods	Sample size	Journal title	Findings/main aspects	Limitations	Future study
17	Key factors hindering sustainable procurement in the Brazilian public sector: A Delphi study		2019	Bazil	Procurement	Sustainable development	N/A	N/A	Qualita-tive	N/A	*International journal of sustainable development and planning*	Thes study foundnout that governemnt bureucarcy and related bottleneck are a hindrance to achievemnet of sustainabel procuremnt in Brazilian public sector	The study narrowly analyzed the Brazilina public sector which is Markedly unique within the global procurement landscape	Future research study should avoid a narrow view of public sector procure-ment
18	Implementation of sustainable public procurement in local governments: A measurement approach	Lily Hsueh, Stuart Bretschneider, JustinStritch	2020	UK	Procurement	Policy implementation	N/A	Procuremnt policies	Quntativte	10	*International journal of public sector management*	Public policy implementtaion is crtical in procuremnet	The studu could not effectively measure sustainable development in the UK public sector	Future studies should focus on harmoniza-tion policies in the public sector
19	E-procurement use in the Nigerian building industry	Ibem, E. O., Aduwo, E. B., Ayo-Vaughan, E. A., Uwakonye, U. O., Owolabi, J. D	2017	Nigeria	E-procurement	Technological enhancements	N/A	Procurment	Quntativte	9	*International journal of electronic commerce studies*	Innovativeness in procurement is critical for efficiency and transparency	The nascent nature of E-procuremnt in Nigeria was a major limitation	Future studies should focus on more developed economies with regards to E-procurment procedures

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S.No	Title	Authors	Year	Place	Context	Independent variable	Mediating variable	Depend variable	Data collection methods	Sample size	Journal title	Findings/main aspects	Limitations	Future study
20	Do sustainable procurement practices improve organizational performance	Mazharul IslamAbalala Turki Md. Wahid MuradAzharul Karim	2017	UAE	Procurment	Sustainable procurment	N/A	Sustain-ability	Quntatitve	25	*Sustainability journal*	The study found that sustainable development practices have a direct impact on frim performance	The study was not conclusive in defining and contextual-izing sustainable development	Future studies should focus on conclusive definition and contex-tualizing of various terms
21	A method to encourage and assess innovations in public tenders for infrastructure and construction projects	Bart Lenderink, Johannes I.M. Halman, Hans Boes and Hans Voordijk	2020	UK	Infrastructure	Procurment	N/A	Infrastruc-ture	Quntatitve	24	*Construction innovation*	The study found that innovation in public sector has a direct impact in successful delivery of govemmnet projects	The study was inconclusve on the nature of impact of innovation on positive delivery of government projects	Future studies should focus on nature of impact of innovation on govemment projects
22	Preparing today for prosperity tomorrow: Using sustainable public procurement as a tool for development in Ghana	A.B. Adjei	2019	Ghana	Procuremnt laws	Sustainable procurement	N/A	Sustain-ability in preocure-ment	Quntatitve	5	*Public contract law journal*	The study found that sustainable public sector procurment in Ghana is widely embraced	The study was qualitative rather than quantitatiev with apparent gaps in findings	Future studies should adopt a quantative methods of study

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S.No	Title	Authors	Year	Place	Context	Independent variable	Mediating variable	Depend variable	Data collection methods	Sample size	Journal title	Findings/main aspects	Limitations	Future study
23	Organization culture and open innovation: A quadruple helix open innovation model approach	*Shazia Parveen, Aslan Amat Senin, Arslan Umar*	2015	India	Organizational culture	Open innovation	N/A	Organization culture in oen innovation	Qualita-tive	N/A	*International journal of economics and financial issues,*	The study found that organizational culture is critical in the ability of an entreprise to embrace open innovation	The study made a feeble connection between orgnaiza-tional culture and the desire to embrace open innovation	Future studies should be conclusive on what is organiza-tional culture with regards to open innovation
24	A systematic review of international entrepreneur-ship special issue articles	Aaron Perenyi, Miklos Losonzc	2018	Australia	Entrepreneur-ship	Entrepreneurshi	N/A	Systematic review	Qualita-tive	N/A	*Sustainability masel*	The studay found motley of articles that advocated for adoption of interantional entreprenurship	The study was inconclsuive with regards to the findings	Future research should focus on one aspect of interna-tional entreprenur-ship
26	Implementation of sustainable public procurement practices and policies: A sorting framework	Eric Prier, Edward Schwerin, Clifford P. McCue	2016	N/A	Pocurement	Sustainable procurement	N/A	Policies	Qualita-tive	N/A	*Journal of public procurement*	The article found a prevalent use of sustainable public procuremnt	The article was inconclsuive on the drivers of sustainable public procuremnt in public sector	Future studies should focus on the drivers of sustainable procure-ment in the public sector

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S.No	Title	Authors	Year	Place	Context	Independent variable	Mediating variable	Depend variable	Data collection methods	Sample size	Journal title	Findings/main aspects	Limitations	Future study
27	Developing strategies to improve agility in the project procurement management (PPM) process	Santosh B. Rane, Shivangi Viral Thakker	2019	N/A	Sustainable Busines	Sustainability in busines processes	N/A	Policies	Qualita-tive	N/A	*Business process management journal*	The article found a major drive among corporates in embarcing the concept of agilty in project procuremnt	The artocel didi not properely define the concept of agility in procuremnet	Future research should delev more deeply on the concept of agility in procure-ment
28	Perspectives of introduction sustainable procurement in public procurement in Russia	Irina Romodina Maxim Silin	2016	Russia	Public procurement	Sustainable procurement	N/A	Sustainable policies	Qualita-tive	N/A	*Oeconomia Copernicana*	The study found that the introduction of sustainable procuremnt in Russia positively influenced organizational perfoemnace	The article ocused on Russia which has a less robust public sector	Future studies should focus on the main drivesr of sustainable procure-ment
29	Innovation and organizational performance: A critical review of the instruments used to measure organizational performance	Tebogo Sethibe, Renier Steyn	2016	N/A	Organizational performance	Measurement of organizational performence	N/A	Internal processes	Qualita-tive	N/A	*The southern arican journal of entrepreneur-ship and small business management*	From the study, innovation is critical in enhancing sustainable innovations	The study was conducted within one institution	Future studies should cover a wide range of sectors for conclusive research

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S.No	Title	Authors	Year	Place	Context	Independent variable	Mediating variable	Depend variable	Data collection methods	Sample size	Journal title	Findings/main aspects	Limitations	Future study
30	Innovative procurement in Poland in the light of the report on the evaluation of public procurement functioning after the amendment of the public procurement law of 2016	Wacława Starzyńska	2016	Poland	Innovation	Procurement	Innovation in procurement	Technology	Qualitative	N/A	*Folia Oeconomica Stetinensia, Journal of Global Entrepreneurship Research*	The study found that innovative procurment is widely embraced in Polish public sector	The study focused on legal constructs of innovative procurment in Polish public sector which is a rather narrow view	Future studies should focus on various hindrances to the implementation of procurement policies in the pulic sector
31	Determinants of firm's open innovation performance and the role of R & D department: an empirical evidence from Malaysian SME's	Waseem Ul Hameed, Mumammd Basher Jawad Iqbal, Ayesha Anwar, Hafiz Ahmad	2018	Malaysia	Open innovation	Innovation performance	Firm performance	Technology	Qualitative	N/A	*Folia Oeconomica Stetinensia,*	The study found out that technology, organizational cultures, and organizational structure are critical determinants of firm'spredilections to open innovation	The study was no emprirically backedwith regards to the findings	Future roles should focus on internal structure of open design

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S.No	Title	Authors	Year	Place	Context	Independent variable	Mediating variable	Depend variable	Data collection methods	Sample size	Journal title	Findings/main aspects	Limitations	Future study
32	Open by design: The role Of design In open innovation	Virginia Acha	2008	UK	Open innovation	Innovation design	Mediating factors	N/A	Qualita-tive	N/A	*Folia Oeconomica Stetinensia,*	The study found that open design as a construct of organizational structure has a positive impact on the abiity of a firm to embrace open innovation	The study was mainly focused on the organiza-tional design of typical enterprise which is rather narrow	Future studies should focus on the role of market as mediating factors in open innovation
33	Open innovation as a value chain for small and medium-sized enterprises: determinants of the useof open innovation	Robert Stanisławski	2020	Poland	Open innovation	Dterminants of open innovation	External and internal factors	N/A	Qualita-tive	N/A	*Folia MDPI jOURNAL*	The study found out that open innovation is a critical process funnel in a typical SME's value chain	The study was inconclusive on the impact of enhanced value chain on organiza-tional performnce	Future studies should provide a link between open innovation and improved value cahin in organiza-tions
34	The impact of innovation on the firm perfor-manceand corporate social responsibility of Vietnamese manufacturing firms	Nguyen Thi Canh1, Nguyen Thanh Liem1,*, Phung Anh Thu2,*andNguyen Vinh Khuong	2019	Vietnam	Open innovation	Dterminants of open innovation	Impact of open innovation on firm performance	N/A	Qualita-tive	N/A	*Folia MDPI jOURNAL*	The study found that open innovation has a direct impact on a firm's ability to embrace and sustain corporate social responsibility	The study provided no link between organiza-tional performance and corporate social respeonbility	Future studies shoud focus on other drivers of firm's perfor-mance, which mediate the concept of open innovation

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S.No	Title	Authors	Year	Place	Context	Independent variable	Mediating variable	Depend variable	Data collection methods	Sample size	Journal title	Findings/main aspects	Limitations	Future study
35	Success factors of open innovation—A literature review	Sussanne, Durst, Pirjo Ståhle	2014	Sweden	Open innovation	Citical success factors	Fcators influencing open innovation	N/a	Qualita-tive	N/A	*Finland Futures Research Centre and Center for Knowledge and Innovation Research*	The study found that technology, and organizational culture are critical in the ability of a firm to embrace open innovation	The study was hampered by volumnious nature of the research, that sometimes threw the findings of the study off-tangent	Future studies should focus more on the different factors that drive open innovation

5 Discussion

Research Q1: Does open innovation impact the achievement of procurement sustainability and effect organizational performance?

The review articles answer the question of how open innovation influences the achievement of sustainable procurement in organizations. The focus of the review centers on the application of innovation as a source of enhancing procurement processes within organizations. The study is centered on the research question and purpose to establish the relationship between open innovation and sustainable procurement. It is essential to acknowledge that few reviewed articles do not directly show the relationship but demonstrate the link between the two variables. Consistent with the question, the independent variable in this case is open innovation, while the dependent variable is sustainable procurement. There are positive outcomes in all the reviewed articles, with all the scholars agreeing with the concept that innovation has a major role in ensuring sustainable procurement practices. From the literature, it can be stated that open innovation is a tool introducing new technology in the procurement process, thus enabling firms to achieve high value.

Various studies examined in the research shows a significant correlation between open innovation, sustainable procurement, and organizational performance. According to Parveen, Senin and Umar (2015), open innovation is a strategic tool for enhancing sustainability within businesses. There are justifications to link open innovation to the attainment of an efficient and transparent procurement process within institutions from the seven reviewed articles. Rane et al. (2019) envision that the capacity of institutions to enhance efficiency is founded on the ability to attain procurement agility as a tool for managing the acquisition of goods and services. This stand is supported by Nyantakyi's (2019) study that exemplifies the role of innovation in enhancing sustainable practices. Acquisition of goods and services as a critical component of business growth has in the past decade been observed to lean on firm's innovation capabilities. A firm's innovation capability has the ultimate effect on the attendant supply chain agility. Iddris et al. (2014) define agility as the ability of an arceytpal firm to adapt, sense, perform and respond in light of an increasingly dynamic and competitive environment. Other scholars such as Cristopher (2012) defines agility as the technical capability of firms to match the demand of goods and services with the attendant supply, mediated by downstream and upstream supply chains. Iddris et al. (2014) avers that a typical firm's agility is a factor open innovation, technology, trust, with the ultimate goal of enhanced competitiveness. The principles of technology applied in acquisition processes play a major role in improving value for money. Prier et al. (2016) posit that procurement processes are considered to attain sustainability when they integrate criteria, specifications, and requirements that favor and align to protecting the environment and supporting constant growth (Yevu & Yu, 2019). This exemplifies the notion that open innovation is a critical factor while striving to achieve sustainable procurement in companies.

The review of past studies shows a significant similarity in establishing the relationship between open innovation and sustainable procurement. From the thirteen

reviewed articles, seven scholars agree that innovation significantly enhances efficiency in acquisition processes. With all articles having a positive relationship, it exemplifies the idea that adoption of technology has enhanced the achievement of procurement agility. With no conflicting findings from the review, it is evident that institutions consistently use open innovation to achieve sustainability and value to stakeholders.

Research Q2: What is the influence of procurement sustainability on organizational performance?

The systematic review involved six articles selected to examine the relationship between sustainable procurement and organizational performance. With respect to the research question, sustainable procurement is an independent variable, while organizational performance is the dependent variable. Few of the articles from the table do not give a direct link between two variables. Nevertheless, there are strategic assessments that correlate sustainable procurement to institutional performance. The review shows positive findings from all the sources used in the current report. This exemplifies the significant relationship between procurement processes and their ability to enhance performance. Also, Yevu and Yu's (2019) findings show that procurement has a significant role in enhancing institutional performance. A similar argument is illustrated by Vluggen et al. (2019) study that focused on examining the role of sustainable procurement in enhancing accountability. Findings from the studies show that for institutions to create an enabling environment characterized by reduced cost and responsibility, procurement agility must be achieved. Stritch, Bretschneider, Darmall, Hsueh and Chen (2020) affirm the role of sustainable procurement processes in enhancing efficiency and addressing the dynamic external and internal factors.

The six articles reviewed to assess the relationship between sustainable procurement and organizational performance show a positive correlation. None of the article's findings show a contradicting argument with respect to the two variables. This illustrates the idea that procurement agility has a mediating role of blending innovation as a tool for promoting organizational performance.

6 Summary

Open innovation is described as a critical aspect that ensures firms apply technology, processes, and inventions that satisfy the need for an economical cost. From the research, it is evident that innovation is an approach for organizations to create value for investment by ensuring consistent growth. Studies show that open innovation is a strategy to ensure firms adapt to the changing business environment, thus enhancing their ability to respond to shifting challenges (Hsueh et al., 2020). Adoption of technology encompasses the integration of critical development and business models, which enhance social responsibilities to stakeholders (Ibem et al., 2017). The application of open innovation in procurement mandates paradigm shifts

in focus, strategy and mindsets while assimilating the process's internal and external factors (Vluggen et al., 2019). While open innovation is a way of introducing new terminology, it plays a key role in enhancing institution's capacity to achieve sustainability (Romodina & Silin, 2016). Its adoption increases the possibility of attaining sustainable procurement processes within organizations.

The current business environment compels institutions to remain adaptive to the changing factors (Lenderinket al., 2020). Markedly, attaining sustainability in the procurement process is a critical aspect while creating value for stakeholders. Open innovation in the procurement process transforms the practice and makes provision for reduced costs, accountability, and efficiency while managing suppliers electronically (Lee et al., 2022a; Rane et al., 2019). Markedly, it exemplifies the mediating role of procurement agility in aligning technological advancement in enhancing institutional performance (Shakhour et al., 2021). It is imperative to state that there is a significant relationship between open innovation, sustainable procurement, and organizational performance (Stritch et al., 2020). Achieving institutional growth relies on the ability to attain effective procurement procedures while, in turn, depends on the invention adopted. This shows a linear relationship between the three variables, thus exemplifying the need for investing in technology as a way of initiating sustainable development in firms (Prier et al., 2016). Innovation streamlines the process of procurement which has a significant impact on performance and the ability to safeguard resources within public and private companies.

7 Research Limitations

The current findings are limited by the drawbacks of the research. The current study relies on secondary data from past researches to affirm the significant relationship between open innovation, sustainable procurement, and organizational performance. One of the drawbacks is the large nature of the search results, triggering a possibility of the researcher taking a different line form the main focus of the study. Similarly, there was no enough literature available on the mediator factor "Procurement Agility". The current report recommends the use of primary data as an approach to verify the findings.

8 Research Future Directions

Future studies are required to exemplify the relationship between open innovation, sustainable procurement, and organizational performance. This can be achieved through a preliminary study or an intense review incorporating data from various libraries and regions. Future studies should also deeply explore the impact of the

concept of procurement agility mediated by procurement sustainability or openinnovation. Or the impact procurement Agility could have on organization performance. There was very little literature availbe on this subject matter.

9 Conclusion

The mediating role of procurement agility is to align the benefits of open innovation as tools for enhancing organizational performance. The process of attaining sustainable procurement is driven by the need to improve institutional performance. Through the invention and adoption of technology, companies have promoted social responsibilities about procuring goods and services. From the current report, it is affirmed that innovation plays a major role in enhancing transparency and accuracy in procurement departments. Besides the limitations of the study, it is conclusive that the role of achieving procurement agility is to ensure new technology is strategically affiliated to address organizational challenges. Additionally, it is also conclusive that there is a positive relation between the variables open innovation, procurement sutainability and organizational performance.

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The Effect of High Commitment Management Requirements in Achieving Strategic Entrepreneurship Through the Perceived Organizational Support in Iraqi Ministry of Health

Waleed Radeef Al-Janabi and Barween Al Kurdi

Abstract This study aimed at identifying the effect of the requirements of the administration of high commitment and its dimensions (normative commitment, career enrichment, job security) on achieving strategic entrepreneurship and its dimensions (entrepreneurial leadership, entrepreneurial culture, risk taking) through perceived organizational support in the Iraqi Ministry of Health. To achieve the objectives of the study, a questionnaire was designed and distributed to a sample of (181) of employees working in the Anbar Health Department / the Iraqi Ministry of Health. The descriptive approach was used to describe the analytical procedures, data collection, classification, processing, and analysis to find out the results, while the heuristic approach was used to analyse, interpret and draw conclusions based on the sample of the study. The results of the study showed that there is a statistically significant impact of high commitment and its dimensions (normative commitment, career enrichment, job security) on strategic entrepreneurship in its dimensions (entrepreneurial leadership, entrepreneurial culture, risk taking) through perceived organizational support. The study recommended to increase the level of high management commitment to develop organisational committeemen amongst the employees as this will lead to positive working experience.

Keywords Commitment management requirements · High commitment · Strategic entrepreneurship · Perceived organizational support

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_88

1 Introduction

Organizations are undergoing cultural, economic, environmental and political changes and challenges, as well as rapid technological changes in the light of the globalization of modern times. Modern technological developments are a motivation for increasing competition among organizations, especially hospitals, in achieving competitive advantage that contributes to increasing health awareness, which maintains growth, continuity and achievement of the desired goals.

The present rapid changes, technological and environmental developments have intensified competition between organizations, leaving many organizations exposed to real risks that have almost ended their life cycle or that of other organizations due to poor risk foreseeing and poor human resource management practices represented by poor polarization, selection, recruitment, incentives and other such practices.

The exposure of many organizations to a wave of rapid changes in various technological, economic and social fields has led them to the need to awaken the spirit of the strategic entrepreneurship within it. The public administration has had few contributions to entrepreneurial activity as an input to the development of organizations, at least if the individual identifies entrepreneurial activity as more than just an investment, as strategic entrepreneurship is linked to the overall strategy of the organization and you may see, for example, that it opens up new branches working on programs and systems with new modes such as e-government (Ghazi & Parvaneh, 2014).

High commitment management practices and perceived organizational support have a clear and important impact on the life of every individual working in the organization through their participation in the organization's policy-making in order to achieve goals and their participation in decision-making, Providing them with opportunities, training and developing them and distributing rewards fairly among them, all this improves performance and excellence in this performance (Said & Al-Nasrawi, 2016).

Hence this study aims at identifying the effect of high commitment management requirements in achieving strategic entrepreneurship through perceived organizational support as an intermediary in health department of Anbar/Iraqi Ministry of Health.

This research also comes as a response to several previous studies (Al-Nuaimi & Hamid, 2015; Said & Al-Nasrawi, 2016; Howard, 2013; Park et al., 2019) which recommended studying the requirements of high commitment management in achieving strategic entrepreneurship.

2 Problem of the Study and the Study Questions

The development of management thought has seen a lot of discussions generated by the requirements and conditions of the work environment and its challenges and dynamic change in the internal and external environment and the opportunities and

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threats it faces. Therefore, a constant change became a necessary characteristic attach to them. The problem of the study lies in the poor employment of high commitment management requirements. In order to achieve strategic entrepreneurship within the organizations, including Anbar Health Service, there are many competent human resources, but they lack the systematic support of the level of awareness on the part of the administrations. This compels these departments to adopt targeted practices in order to invest and develop these human resources to enable them to properly think about opportunities and commit themselves to confronting threats in a way that will lead to the strategic entrepreneurship of their organizations.

Hence, the problem of the study is reflected in the answer to the following questions:

Do the requirements of managing high-level commitment to its dimensions (normative commitment, job enrichment, job security) have any effect on strategic entrepreneurship in its dimensions (entrepreneurial leadership, entrepreneurial culture, taking risks) in Anbar Health Directorate/Iraqi Ministry of Health?

It gives rise to the following sub-questions:

The first Sub-question: Do the requirements of the high commitment management in its dimensions (normative commitment, job enrichment, job security) have an effect on the entrepreneurial entrepreneurship of the Anbar Health Directorate/Iraqi Ministry of Health?

The second sub-question: Do the requirements of the management of high commitment to its dimensions (standard commitment, job enrichment, job security) have an effect on the entrepreneurial culture at Anbar Health Directorate/Iraqi Ministry of Health?

The third sub-question: Is there an effect of risk taking on the requirements of high commitment management (standard commitment, job enrichment, job security) in Anbar Health Directorate/Iraqi Ministry of Health?

The second main question: Is there an effect of the requirements of high commitment management in their dimensions (normative commitment, job enrichment, job security) on the perceived organizational support in Anbar Health Directorate/Iraqi Ministry of Health?

The third main question: Is there an effect of perceived organizational support on strategic entrepreneurship in its dimensions (entrepreneurial leadership, entrepreneurial culture, risk taking) in Anbar Health Directorate/Iraqi Ministry of Health?

The fourth main question: Do the requirements of high commitment management (normative commitment, job enrichment, job security) have an effect on the strategic entrepreneurship (entrepreneurial leadership, entrepreneurial culture, risk taking)?

3 Significance of the Study

This study contributes in its attempt to fill the deficit of the Arab Research Group on the concept of high commitment management requirements in achieving strategic entrepreneurship, where most of the previous studies focused on studying the relationship between independent and dependent variable only. Whereas this study takes a third variable, which is the perceived organizational support medium variable which will add a cognitive accumulation to the previous studies and scientific libraries. The importance of this study is also reflected in the recommendations that will be proposed to the Anbar Health Directorate at the Iraqi Ministry of Health, which illustrates the effect of the requirements of high commitment management via focusing on their dimensions (normative commitment, job enrichment, job security), develop the inspection unit's understanding of the strategic entrepreneurship of the workers at department of health, and how to grow and develop it in the way that achieves the continuity, efficiency and effectiveness of the organization via the organizational support to all parties.

4 Literature Review

This aspect includes a presentation of the theoretical framework and literature related to the subject and variables of the study, through a review of Arabic and English previous studies related to the current study.

4.1 High Commitment Management

The concept of a high level of commitment in its various forms is one of the management practices that has received increasing attention from researchers. This interest has led to its widespread perception among managers and academics that a high level commitment represents a crucial element to link the organization with the individuals working in it. Harem (2004) indicates that the commitment of individuals to their organizations is an important factor in ensuring the success of those organizations.

Although more and more researchers are interested in the topic of high commitment, there is no agreement among them on a specific definition of this concept due to the multiplicity of perspectives and angles that researchers have looked at and the difficulty in defining this behavior input. Al-Sameeh (2010) defines it as an emotional connection between the organization and its values and goals. Al-Shayab and Abu Hammour (2014) focus on the psychological perspective of commitment and define it as the psychological bond that binds the individual to the organization, which leads him to integrate into work and to embrace the values of the organization. Qassimi (2011) defines it as "a strong belief and acceptance by individuals of

the organization's goals and values, and their desire to make a greater contribution to it, with the strong desire to continue its membership." Flayiah and Abdul Majid (2014) add that "The commitment is the positive feeling generated by the employee towards his organization, his commitment to it, his loyalty to it, his conformity with its values and objectives, his commitment to its survival through exerting efforts and favoring it from other organizations, and be proud of its effects, which enhances its success." According to the perspective of the authors of this study, the commitment is considered a mutual investment between the individual and the organization via the continuation of the contractual relationship between them, where the individual has the desire to give more in order to contribute to the success and continuation of the organization.

The previous studies have discussed three dimensions of high commitment: Normative commitment, job enrichment and job security (Howard, 2013; Al-Gharbawi, 2014; Al-Nuaimi & Hamid, 2015; Said & Al-Nasrawi, 2016; Park et al., 2019).

Concerning the concept of normative commitment, it refers to the individual's feeling of being committed to remain in the organization because of the pressures of others. Individuals with a strong normative commitment take into account what others will say if they leave the organizations in which they work, so these individuals don't want to make a bad impression on their colleagues by leaving their organizations, due to their literary obligation even if it is at the expense of themselves (Park et al., 2019).

On the other hand, career enrichment is what makes working individuals more responsible and independent in decision-making, and this, in turn, strengthens organizational commitment to work. Career enrichment is achieved through the workers' sense that the benefits of the organization also benefit them (Howard, 2013) because this feeling would strengthen their commitment to the organization. Some organizations are trying to do this directly through incentive schemes, particularly profit-sharing programs. Such plans and programs, if managed in a fair manner, will play an effective role in supporting individuals' organizational loyalty.

As far as the third dimension of high commitment is job security. This concept refers to the power of one's desire to remain in an organization because he believes that leaving would cost him dearly. The longer an individual lasts in the organization, the more likely an individual will lose much of what he or she has invested in overtime such as: (Pension plans, intimate friendships for some individuals). Many individuals are unwilling to sacrifice such things, and they are said to have a high degree of continuing loyalty (Howard, 2013).

4.2 The Strategic Entrepreneurship

There have been a number of definitions related to the concept and nature of entrepreneurship in recent times. Some definitions refer to leadership as the ability and desire to organize and manage related businesses, in addition to including some definitions on new concepts, innovation, innovation, and risk (Agostini & Nosella,

2017). Entrepreneurship was defined as the process of creating something a new and valuable thing by devoting the time and necessary effort by assuming accompanying physical, psychological, and social risks, and reaping the resulting financial returns (Oviat & McDougall, 2005). Mandel and Barnes (2014) defined it as "activities involving new product or processes, or entering new markets, or creating new enterprises". Seitovirta (2011) defined it as "the process of creating a new valuable thing via allocating the time, effort and money needed for the project, bearing the accompanying risks, and receiving the rewards for what happens when wealth is accumulated."

All in all, there is a consensus among researchers on the importance of strategic entrepreneurship and its role in developing and supporting the economies of countries, especially after the major shift in the capital economy to the knowledge economy, in the hope of achieving the economic stability that all peoples seek to ensure for themselves economic and political security (Sultan, 2016). The technological and scientific development in modern business organizations has helped to develop many entrepreneurial organizations in various sectors of business, especially with the increase of global competition and the emergence of other factors to make organizations more pioneering, and the exploitation of investment opportunities in the market through innovation and innovation, as well as the entrepreneurial processes that have become part of the strategic management of the work of these organizations (Plummer, 2016). Workers entrepreneurship is used to demonstrate innovators and inventors in all fields via showing their achievements and successes despite the lack of resources, capabilities and difficulties they have faced. In light of the ongoing and increasing economic globalization, the idea of entrepreneurship on the subject has become the focus of attention of leaders and managers, not only in their understanding of the subject, but also in the ability to develop strategies and appropriate planning for the success of organizations and the persistence of institutional excellence. Accordingly, entrepreneurship is one of the competitive advantages of today's organizations. In order for the organization to succeed, it must develop a vision that encourages growth through entrepreneurship (Ismail, 2010). Based on the above, it can be said that leadership plays a pivotal role in achieving success. It pursues the task of defining and articulating the goals and objectives of each phase of the implementation of the organization's strategy, which identifies the necessary resources, manages them and distributes them to the different business units and job areas of the organization.

4.3 Perceived Organizational Support

Business organizations are currently facing a complex and rapid set of global and local challenges. It is imperative that organizations address these challenges in all ways. To achieve this, the organization, represented by its management, has to undertake many planned and targeted activities that provide financial, psychological and social support to workers, reflecting its concern for human resources and

its interest in meeting their needs and motivations (Anomneze et al., 2016). Hence the importance of the concept of conscious organizational support, which refers to the level of moral and material support provided by the management to employees, through which the employees feel that the management appreciates and appreciates their efforts. In return, the Organization obtains high performance and commitment (Mansour & Ashour, 2016).The theory of organizational support (perceived organizational support) derives from the theory of social exchange and exchange values. According to the theory of social exchange, individuals who benefit from the actions of one party or another feel a commitment towards reciprocity in the form of certain patterns and responses (Drover & Ariel, 2015). A high perception of organizational support can, therefore, create a sense of commitment on the part of the individual that makes him/her feel that he/she needs not only to belong to the organization but also to feel that he/she has a commitment to reinstate the organization's affiliation by engaging in behaviors that support organizational goals.

4.4 Previous Related Studies

Researchers have drawn from many Arab and foreign references to formulate the study's assumptions. For example, Al-Nuaimi and Hameed study (2015) aims at clarifying the relationship between high commitment management activities and strategic entrepreneurship in Iraqi constructions activity. The study has found out a number of results, the most important ones are the effective relationship and a link between high commitment management and strategic entrepreneurship indicating that providing high commitment management requirements contributes to building strategic entrepreneurship in studied companies. In another study, Said and Al-Nasrawi (2016) aims at clarifying the nature of the relationship and the impact between the management of high commitment and organizational excellence et al.-Furat General Company for Chemical Industries. One of the most important results of this study is that the management of high commitment has a positive effect on the organizational excellence. On the other hand, Mansour and Ashour (2016) tested the mediating role of perceived organizational support between the High Containment Department and the company's organizational commitment. The results of this study indicated a positive and moral impact between global containment management and organizational commitment through perceived organizational support. In contrast, Khudayr and Ahmed (2017) conducted a study to examine the relationship between the perceived organizational support and professional compatibility and their effect on reducing organizational satire found that cognitive organizational support and professional consensus combined had an impact on reducing organizational satire. As for Al-Hawajira study (2018), it aimed at measuring the impact of the organizational entrepreneurship on the strategic success through business intelligence capabilities in universities and found that organizational leadership has an impact on strategic success, and that organizational leadership has an impact on business intelligence capabilities. Al-Tahan (2018) also conducted a research to understand the

impact of future vision on achieving the strategic entrepreneurship by organizations in the Egyptian telecommunications sector and found that it has a positive impact on looking ahead in achieving the strategic entrepreneurship by the organizations.

On the other hand, Farndale et al. (2011) study aimed at knowing the perceptions of workers on managing commitment, high performance, roles of justice and trust in the organization. The study community and its sample of workers consisted of four organizations in the United Kingdom. The most important finding of the study was that there was a correlation between the expertise of highly committed, high-performing, fair and trusting employees that influenced human resources management practices. Kraus and his colleagues' study (2011) aimed at organizing and synthesizing the current scientific work on the strategic entrepreneurship using the formation approach, finding that strategic entrepreneurship contributed to understanding how companies were creating a new enterprise that could be moved to the greater level of corporate strategies, whether small or medium. Howard (2013) in his study discussed the relationship between the high commitment to human resources management and the employee's well-being in three large organizations in South Africa and found a strong correlation between the human resources management content and the employee's well-being. The study also reached the most important recommendations on the need to have positive effects on organizations, human resources management activities and employees in order to achieve high commitment in organizations. The study of Ghazi and Parvaneh (2014) examined the different dimensions of strategic entrepreneurship as well as understanding the dimensions of strategic entrepreneurship from the theory to practice through the employment of many startup companies in Iran. The most crucial findings of this study are the emphasis on business leadership and innovation, capital mobilization, entrepreneurship and leadership management, the simultaneous attention to the strategic entrepreneurship, management and growth, and finally the profitability.

4.5 What Distinguishes the Current Study From Previous Studies?

Several issues exist that are important to highlight to demonstrate the merit of this study over previous studies. First, the objective of the study, it aims at measuring the impact of high commitment management requirements in achieving strategic entrepreneurship through the perceived organizational support in Anbar Health Directorate/Iraqi Ministry of Health. Most of the previous studies addressed only two variables, such as the study of (Al-Gharbawi, 2014), the study of (Al-Nuaimi & Hamid, 2015), the study of (Said & Al-Nasrawi, 2016), and the study of (Park et al., 2019). This study addressed a third variable, the organizational support that is aware of its impact on the relationship between the dependent and independent variable. Second, study variables: The study looked at the dimensions of their independent variable, the requirements of managing high commitment (normative commitment,

job enrichment, job security). Their dependent variable was strategic entrepreneurship, represented by dimensions (entrepreneurial leadership, entrepreneurial culture, risk taking) through their intermediate variants and perceived organizational support. Third: Study environment: Most of the previous studies that were examined varied in their environment, and the studies that were conducted were applied to address them. However, most of these studies did not take into account the Iraqi environment. The importance of this study results its attempts to add an in-depth understanding of the concepts of managing high-level commitment and strategic entrepreneurship in an environment that was not previously addressed in the researches.

5 Hypotheses of the Study

The following hypotheses have been formulated in the preceding paragraphs in terms of the object and importance of the study, and as an indication from previous scientific studies.

The first main hypothesis H01: There is no statistically significant impact at the level ($\alpha \leq 0.05$) of the requirements for managing the global commitment in its combined dimensions (normative commitment, job enrichment, job security) on strategic entrepreneurship in its combined dimensions (leadership, leadership culture, risk taking) in the Anbar Health Directorate/Iraqi Ministry of Health.

A number of sub-hypotheses emerge from this main hypothesis:

The first sub-hypothesis: H01-1: There is no statistically significant effect at significance level ($\alpha \leq 0.05$) of the requirements of the high management Commitment in its dimensions (normative commitment, job enrichment, job security) are placed on the entrepreneurial leadership of Anbar Health Directorate/Iraqi Ministry of Health.

The second sub-hypothesis: H01-2: There is no statistically significant effect at significance level ($\alpha \leq 0.05$) of the requirements of the high management commitment in its dimensions (normative commitment, job enrichment, job security), over the entrepreneurial culture in Anbar Health Directorate/Iraqi Ministry of Health.

The third sub-hypothesis: H01-3 There is no statistically significant impact at the level of the ($\alpha \leq 0.05$) of the requirements of the high management commitment in its dimensions (normative commitment, job enrichment, job security) on the risk taking in the Anbar Health Directorate/Iraqi Ministry of Health.

The second main hypothesis: H02: There is no statistically significant effect at significance level ($\alpha \leq 0.05$) of the requirements of the management of high commitment in its combined dimensions (normative commitment, job enrichment, job security) depend on the perceived organizational support at Anbar Health Directorate/Iraqi Ministry of Health.

The third main hypothesis: H03: There is no statistically significant impact at the significance level ($\alpha \leq 0.05$) of the perceived organizational support on the strategic entrepreneurship in all its dimensions (entrepreneurial leadership, entrepreneurial culture, risk taking) in Anbar Health Directorate/Iraqi Ministry of Health.

The fourth main hypothesis: H04: There is no statistically significant effect at significance level ($\alpha \leq 0.05$) for the requirements of high managing commitment in its combined dimensions (normative commitment, job enrichment, job security), focusing on strategic entrepreneurship in its combined dimensions (entrepreneurial leadership, entrepreneurial culture, risk taking) through the perceived organizational support at the Anbar Health Directorate /Iraqi Ministry of Health.

6 Model of the Study

To achieve the objective of the study, a special model was developed that was shown in Fig. 1 as the following (Table 1).

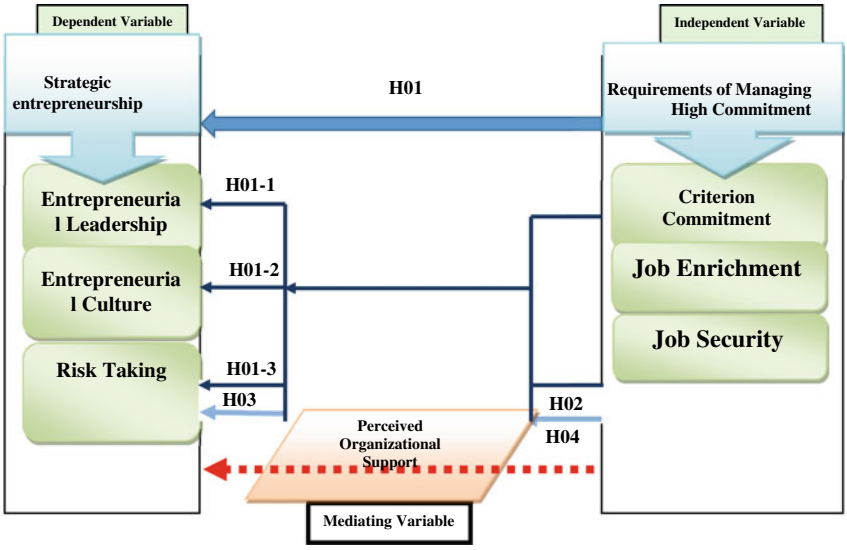

Fig. 1 Model of the study

Table 1 References and studies that support the model of the study

Variable	Studies depended on
Requirements of managing high commitment	Al-Gharbawi (2014), Al-Nuaimi and Hamid (2015), Said and Al-Nasrawi (2016), Howard (2013), Park et al. (2019)
Perceived organizational support	Al-Shanty (2015), Mansour and Ashour (2016), Khudayr and Ahmad (2017), Worku (2015), Gigliotti et al. (2019)
Entrepreneurial leadership	Al-Nuaimi and Hamid (2015), Al-Hawajira (2018), Al-Tahan (2018), Kraus et al. (2011), Ghazi and Parvaneh (2014)

7 Methodology

7.1 Method of the Study

To achieve the objective of the study which used the descriptive analytical approach, two approaches were used: The first approach is theoretical, and I use desk surveys to look at existing books, references, resources, and studies relevant to the subject of the study, to construct a theoretical background for the study. Concerning the second field approach, I used the study tool (the questionnaire), which was developed to collect data from the research category and to work on analyzing them statistically to achieve the study's objective.

7.2 Population and Sample of the Study

The population of the study consisted of all the approximately 347 employees working at various administrative levels in the Anbar Health Directorate/Iraqi Ministry of Health. Based on Sekaran and Bougie (2012), a random sample of employees was collected through the distribution of (181) questionnaires, of which (176) were retrieved, and (5) were excluded because the respondents did not complete the answers that the number of questionnaires subject to analysis was to (171), rated 94% of the total distributed questionnaires.

7.3 Instrument of the Study

In order to achieve the study's objectives, its questionnaire was developed as a study tool, and it was developed in a way that corresponds to the study variables by looking at previous studies related to the study topic. The questionnaire consisted of three

Table 2 Likert pentagonal graded scale

Mark	1	2	3	4	5
Agreement level	Strongly agree	Agree	Moderately agree	Disagree	Strongly disagree

parts: The first part aims at collecting demographic data for study sample individuals (age, education qualification, number of years of experience, job title), and the second part is related to the independent variable (requirements for managing high commitment) in its dimensions (normative commitment, job enrichment, job security). In order to develop this part, previous studies were made use of via using Al-Gharbawi (2014), Al-Nuaimi and Hamid (2015), Said and Al-Nasrawi (2016), Howard (2013), Park et al. (2019). The third part is the dependent variable (strategic entrepreneurship) in its dimensions (entrepreneurial leadership, entrepreneurial culture, risk taking) through the studies of Kraus et al. (2011), Ghazi and Parvaneh (2014), Al-Nuaimi and Hamid (2015), Al-Hawajira (2018) and Al-Tahan (2018). The intermediate variant (perceived organizational support), via using the Al-Shanty (2015), Worku (2015), Mansour and Ashour (2016), Khudayr and Ahmed (2017) and Gigliotti et al. (2019) studies. The study tool was developed via using the exploratory factor analysis and the confirmatory factor analysis.

A progressive Likert scale was adopted in the resolution to give more flexibility to the sample members in the selection as shown in Table 2.

Table 3 shows the related limits adopted by this study, when commenting on the arithmetic mean of the variables in the study model and determining the degree of approval, the researcher has determined three levels (high, medium, low) based on the following equation.

Length of period = (upper limit of alternative−lower limit of alternative)/number of levels.

(5–1)/3 = 4/3 = 1.33 so the levels are as follows:

A low approval score of 1-less than 2.34.

An average approval score of 2.34-less than 3.68.

A high approval score of 3.68–5.

Table 3 shows the measure in determining the level of fit for the arithmetic mean to be used when commenting on arithmetic means.

Table 3 Likert scale treatment

Mean	Degree evaluation
1. Lower than 2.34	Low
2. 34- Lower than 3.68	Middle
3. 68–5	High

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Table 4 Reliability coefficient of the study instrument

	Cronbach's alpha
Requirements of managing high commitment	0.773
Perceived organizational support	1000
Entrepreneurial leadership	0.841

7.4 Validity and Reliability of the Study Istrument

The study instrument was validated by presenting it in its initial form to a group of academic arbitrators with expertise and competence to verify the veracity of the contents of its paragraphs and to ascertain their validity to measure what should be measured and to ascertain the clarity of its paragraphs and the verbal and moral validity of their words. Their observations on the study instrument were taken and paragraphs were modified, deleted and added until the tool was finalized. Cronbach's alpha was also used to check internal consistency. It measures the consistency of the researchers' answers to the questions in the full scale, and its high value indicates a persistence between 0 and 1, acceptable at (0.60) and above. According to other Vogt study, the value of Cronbach alpha is acceptable if it is greater than (0.70) (Table 4).

8 Study Findings and Discussion

8.1 Description of Study Sample Properties

This part of the study aims at showing the frequency and percentages of demographic variables for respondents regarding the first section of resolution, in terms of age, gender, educational level, and number of years of experience. Table 5 shows the responses of the study sample.

Table 5 showed that the majority of study sample members were in the age group (35-under-45) at 63.2% (n = 108), followed by the sample members in the age group (25-under-35) at 18.1% (n = 31), and then the sample members were in the age group (45 years and older) at 16.4% (n = 28). Finally, the sample population was 2.3% (n = 4) in the age group (under 25 years). It also showed that (77.8) of the study sample were male and (22.2) of the study sample were female. This finding reflects the fact that the proportion of male health workers is higher than that of female workers. The data also show that the majority of the study sample had a bachelor's degree of 69.5% (n = 119), followed by those with a diploma score of 12.3% (n = 21). Then those with a master's degree of 11.7% (n = 20) and finally those with a doctorate of 2.9% (n = 5). This is an indication of the interest of the research sector in recruiting those with scientific qualifications. As for the number of years of experience, the data in Table 5 indicates that the majority of the sample members were 66.1% (n

Table 5 Frequencies and percentages of sample responses of the study based on their demographic variables

Variable	Group	Frequency	Percentage
Age	Lower than 25 Years	4	2.3
	25 Years–Lower than 35 Years	31	18.1
	35 Years–Lower than 45 Years	108	63.2
	45 years and above	28	16.4
	Total	171	100.0
Sex	Male	133	77.8
	Female	38	22.2
	Total	171	100.0
Academic qualification	Diploma or below	6	3.5
	Diploma	21	12.3
	Bachelor	119	69.5
	Master	20	11.7
	Doctorate	5	2.9
	Total	171	100.0
Experience period	Lower than 5 Years	3	1.8
	5 Years–Lower than 10 Years	14	8.2
	10 Years–Lower than 15 Years	41	24.0
	15 Years of above	113	66.1
	Total	171	100.0

= 113), whose years of experience ranged from (15 years and older), followed by those whose years of experience were 10 and younger than 15 years old by 24% (n = 41), those whose years of experience (5-less than 10 years) by 8.2% (n = 14), and finally those whose years of experience were less than 5 years by 1.8% (n = 3). This is an indication that researchers have reached the appropriate categories to answer the study tool's paragraphs.

8.2 Description of Study Variables Results

The mission of this part of the study is to describe the basic study dimensions according to the estimates of the study sample members, through their answers to the elements of questionnaire with their sub-variables.

First: Describing the high commitment management variable in its different dimensions: Normative commitment, job enrichment and job security

Table 6 shows that the arithmetic averages of responses of sample members to high compliance management requirements between (4.35 and 4.00) with a high rating for all dimensions ranked first after "standard commitment" with an arithmetic mean (4.35), second after "job enrichment" with an arithmetic mean (4.13), third after "job security" with an average of 4.00), and third after "computational average" with high compliance management requirements (4.16) with a high rating.

Second: Describing of the mediating variable: the Perceived organizational support

Arithmetic means and standard deviations were extracted for the responses of the sample individuals to the dimensions of the perceived organizational support, Table 7 shows this.

Table 7 shows that the arithmetic means of the workers' sample responses around the perceived organizational support variant ranged from (4.21–2.35), hence we note that the sample of workers gave consent to all paragraphs of the perceived organizational support variant. Paragraph 22, which reads: "management cares about

Table 6 Comparison of means, standard deviations, and level of significance of the dimensions of the requirements of managing high commitment

No	Item	Mean	Rank	Level of significance
1	Criterion commitment	4.372	1	High
2	Job enrichment	4.13	2	High
3	Job security	4.00	3	High
Requirements of managing high commitment		4.16	–	High

Table 7 Means, standard deviations, and of the sample responses of the perceived organizational support

Item no	Mean	Standard deviation	Rank	Level of significance
22	4.21	0.836	1	High
23	4.04	0.777	2	High
24	3.97	0.928	3	High
25	3.92	0.926	4	High
26	3.87	0.889	**7**	High
27	3.87	0.864	**8**	High
28	3.75	0.987	9	High
29	2.35	1.26	10	High
30	3.91	0.941	5	High
31	3.89	0.936	6	High

Table 8 Means, standard deviations, and significance level of strategic entrepreneurship dimensions

No	Item	Mean	Rank	Level of significance
1	Entrepreneurial leadership	3.78	3	High
2	Entrepreneurial culture	4.03	1	High
3	Risk taking	3.97	2	High
Requirements of strategic entrepreneurship		3.92	_	High

meeting my job needs and desires", gave the highest of the paragraphs on average (4.21) and with a standard deviation (0.836), and at a high level of importance, while paragraph (29), which states that: "I'm looking for another organization to work on seriously," at a minimum, with an average score of 2.35, a standard deviation of 1.26, and of average relative importance.

In general, the total sum of the means of this variable was 3.78, indicating that the relative importance of the perceived organizational support was high, with a standard deviation (539), which reflects a lack of dispersion and homogeneity of study sample responses to the study paragraphs.

Third: Description of the dependent variable: Strategic entrepreneurship in its various dimensions: entrepreneurship, entrepreneurial culture, and taking risks

Arithmetic means and standard deviations were extracted for the respondents' answers to the dimensions of strategic entrepreneurship, Table 8 shows this. The table shows that the arithmetic averages of the respondents' responses to strategic entrepreneurship between (4.03 and 3.78) with high score for all dimensions came first after "entrepreneurial culture" with an arithmetic average (4.03), second after "risk taking" with an arithmetic mean (3.97), third after "entrepreneurial culture" with an arithmetic mean (4.03), and the arithmetic average of strategic entrepreneurship (3.92) with high score.

8.3 Testing the Hypotheses of the Study

This part of the study pertains to the testing of the main study hypotheses and their sub-hypotheses, in order to arrive at the presentation of results and clarify the behavior of the relationships between the study variables.

Results of the main hypothesis (H01) test

There is no statistically significant impact at the level ($a \leq 0.05$) of the requirements for managing the global commitment in its combined dimensions (normative commitment, job enrichment, job security) on strategic entrepreneurship in its combined dimensions (leadership, leadership culture, risk taking) in the Anbar Health Directorate/Iraqi Ministry of Health.

Table 9 shows the statistical results of testing the first main hypothesis (direct effect) as follows.

Via extrapolating the results in Table 9, we note that the value of the marker (R2) is 658, which means that the high-commitment management requirements variant accounts for 65% of the variation in the dependent variable (strategic entrepreneurship). The results indicate a statistically significant effect of the high-commitment management requirements variant in strategic entrepreneurship, with beta (811.) and t (25.411) being less than 0.005.

Result of testing the first sub- Hypothesis (H01-1)

Table 10 shows the result of the test for the first sub-hypothesis from the first major hypothesis that there is a statistically significant effect of the requirements of the Department of High Commitment on leadership, with a beta value (0.757) and a t value (15.186) with a significance level (0.00) less than (0.05).

Result for testing the second sub-hypothesis (H01-2)

Table 11 Result of the test of the second sub-hypothesis from the first main hypothesis, showing statistically significant effect of the requirements of the management of high Commitment on entrepreneurial confidence, with beta (B) with value of (640.) and (t) with value of (12.220) with a significance level of (0.00) less than (0.05).

Table 9 Results of (SmartPLS) of measuring the effect of the requirements of managing high commitment on strategic entrepreneurship

R-squared value of the model	Beta value	Calculated T- value	Level of significance
0.658	0.811	25.411	0.000

* Statistically significant at ($\alpha \leq 0.05$)

Table 10 Results of (SmartPLS) of measuring the effect of the requirements of managing high commitment on entrepreneurial leadership

Beta value	Calculated T value	Level of significance
0.757	15.186	0.00

* Statistically significant at ($\alpha \leq 0.05$)

Table 11 Results of (SmartPLS) of measuring the effect of the requirements of managing high commitment on entrepreneurial confidence

Beta value	Calculated T value	Level of significance
640	12.220	0.00

* Statistically significant at ($\alpha \leq 0.05$)

Table 12 Results of (SmartPLS) of measuring the effect of the requirements of managing high commitment on risk taking

Beta value	Calculated T value	Level of significance
759	15.186	0.00

* Statistically significant at ($\alpha \leq 0.05$)

Result of testing the third sub-hypothesis (H01-3)

The result of the third sub-test derived from the first major hypothesis shows a significant effect of the requirements of the High commitment Management on the risk taking, with a value of beta (B) of (759) and a value of (t) of (15.186) with a significance level of (0.000) less than (0.05) (Table 12).

Results of testing the second main hypothesis (H02)

The second main hypothesis was tested which states that there is no statistically significant effect at a significant level of ($a \leq 0.05$) for the management requirements of high commitment in their combined dimensions (normative commitment, functional enrichment, job security) on the perceived organizational support in Anbar Health Directorate/Iraqi Ministry of Health.

Via extrapolating the results in Table 13, we note that the R2 coefficient is (563). (This means that the high commitment management requirements variant accounts for 56.3% of the variation in the median variance and perceived organizational support.

A statistically significant effect of the requirement management variant for high commitment management is evident in perceived organizational support, with a value of beta (B) of (730.) and a value of (t) of (18.805) with a significance level of (0.000) less than (0.05).

Table 13 Results of (SmartPLS) of measuring the effect of the requirements of managing high commitment on the perceived organizational support

R-squared value of the model	Beta value	Calculated T-value	Level of significance
0563	0.0730	18.805	0.000

* Statistically significant at ($\alpha \leq 0.05$)

Table 14 Results of (SmartPLS) of measuring the effect of the perceived organizational support on the strategic entrepreneurship

R-squared value of the model	Beta value	Calculated T- value	Level of significance
0.660	0.179	2.263	0.024

* Statistically significant at ($\alpha \leq 0.05$)

Results of testing the third main hypothesis (H03)

The third main hypothesis was tested, showing that "there is no statistically significant impact at the significance level $\alpha \leq 0.05$) of organizational support recognized for strategic entrepreneurship in all its dimensions (leadership, leadership, leadership culture, risk taking) in the Anbar Health Department/Iraqi Ministry of Health".

Via extrapolating the results in Table 14, we note that the value of the marker (R2) is (0.660), which means that the intermediate variant (perceived organizational support) accounts for 66% of the variance in the dependent variable (strategic entrepreneurship). A statistically significant effect show a statistically significant effect of the perceived variant, with a value of beta (B) of (179.) and a value of (t) of (2.263) with a significance level of (0.024) less than (0.05).

Result of testing the fourth main hypothesis (H04)

The fourth key hypothesis that there is no statistically significant effect was tested at a significance level ($\alpha \leq 0.05$) for the requirements of managing the high commitment in its combined dimensions (normative commitment, job enrichment, job security), on the strategic entrepreneurship in its combined dimensions (entrepreneurial leadership, entrepreneurial culture, risk taking) via the perceived organizational support of Anbar Health Directorate/Iraqi Ministry of Health.

There is a statistically significant effect of the perceived organizational Support variable, which is recognized in the relationship between the requirements of high commitment management and the strategic entrepreneurship in both courses:

First direct course: The direct course value of beta(B) is 672 and the direct course value of (t) is 9.748 with a significance level of (0.000) less than (0.05).

The second indirect course: The indication of beta values (B) in the indirect course are respectively (0.730) and (179), and (t) values, which were (16.805) and (2.263), with a significance level (0.000) for both courses, less than (0.05). These values indicate that the medium resulting from the perceived organizational variable is considered a partial medium, as the results demonstrated a direct effect of the requirements of the high commitment management without the intermediate variant. However, the effect is considered as the median variable, since the value of the marker (R2) before the intervention of the mediator (perceived organizational support) was (0.658) With regard to the first hypothesis, after the entry of the mediator, this percentage rose slightly by (0.02), which means that the variant of requirements for high commitment management in its combined dimensions refers to a value (66.0%) of the variation in the dependent variable (strategic entrepreneurship) (Table 15).

Table 15 Results of track analysis (Smart PLS) to measure the effect of the requirements of managing high commitment in their combined dimensions on the strategic entrepreneurship via perceived organizational support as a mediating variable

Direction	Beta value for indirect direction	Beta value for direct direction	The calculated T-value	Significance level
Requirements of managing high commitment -> The perceived organizational support		0.730	16.805	0.000
The perceived organizational support-> The strategic entrepreneurship		0.179	2.263	0.024
Requirements of managing high commitment -> The perceived organizational support-> The Strategic entrepreneurship	0131		2.234	0.000
Requirements of managing high commitment - > The strategic entrepreneurship		0.672	9.748	0.000

9 Results' Discussion

9.1 Discussing the Results of the First Main Hypothesis

That there is a statistically significant impact at the significance level ($\alpha \leq 0.05$) of the requirements for managing the high-level commitment to its dimensions on strategic entrepreneurship. The results indicate a statistically significant effect of the variant in the demands of managing high commitment in strategic entrepreneurship, reaching a beta value (B) (811) and a (t) value (25.411) with a significance level (0.000) less than (0.05). This finding was consistent with Howard study (2013) and Al-Naimi and Hamid (2015) studies in which it was stated that there is an effect of high commitment management requirements on the strategic entrepreneurship.

9.2 Discussing the Results of the Sub-hypotheses Arising from the First Main Hypothesis

1. Discussing the results of the first sub-hypothesis, which states that there is a statistically significant impact at the significant level of ($\alpha \leq 0.05$) of the requirements of the high Commitment management in its dimensions (normative commitment, job enrichment, job security) on the entrepreneurship in "Anbar Health Directorate/Iraqi Ministry of Health."

   As it is proved by the value of beta (ß), which amounted to (0.757) and the value of (t) which amounted to (15.186) with a significance level of (0.00) less than (0.05). This result is consistent with a study (Farndale et al., 2011), which concluded with some results that indicate that there is a correlation between the experiences of employees with commitment, high performance, fairness and confidence, which affect the activities of human resources management, and accordingly the researcher believes that the high level of commitment of working individuals helps entrepreneurial leadership in the Health office.
2. Discussing the results of the second sub-hypothesis, which states that there is a statistically significant impact at the level of significance ($\alpha \leq 0.05$) of the requirements of the management of high compliance in its dimensions (normative commitment, job enrichment, job security) on the entrepreneurial culture in the "Anbar health department/ Iraqi Ministry of Health."

   It is evidenced by the value of beta (B) of (640.) and (t) of (12.220) with a significance level of (0.00) less than (0.05). This finding is consistent with a study of Al-Hawajira (2018) which concluded that some findings suggest that enhancing a the entrepreneurial culture, linking it to strategy, goals and short and long-term performance outcomes, and attempting to transform the organizational structure from a bureaucratic one into a flat structure based on intelligence capabilities.
3. Discussing the results of the third sub-hypothesis, which states that there is a statistically significant effect at the level of significance ($\alpha \leq 0.05$) of the high commitment management requirements in their dimensions (normative commitment, job enrichment, job security) on risk taking in Anbar Health Directorate/ Iraqi Ministry of Health.

   As it is proved by the value of beta (ß), which amounted to (0.759) and the value of (t) which amounted to (15.186) at the level of significance (0.000) less than (0.05). The result is therefore considered compatible with a study of Said and Al-Nasrawi (2016).

9.3 Discussing the Results of the Second Main Hypothesis

There is a statistically significant effect at the significant level of ($\alpha \leq 0.05$) for the requirements of the high commitment management in all its combined dimensions

(normative commitment, job enrichment, job security) on the perceived organizational support in Anbar Health Directorate/Iraqi Ministry of Health. "the result of the second main hypothesis indicates that there is a statistically significant effect of the high commitment management requirements variable in perceived organizational support, with a beta value (ß) of (0.730). and the value of (t) which amounted to (18.805) with a level of significance (0.000) which is less than (0.05).

The results also showed that the R2 value is (0.563). This means that the high commitment management requirements variable accounts for (56.3%) of the variance in the intermediate variable perceived organizational support. This result is similar to the results of the studuies of Worku (2015) and Mansour and Ashour (2016), and in terms of the presence of a variable effect in the high commitment in the perceived organizational support.

9.4 Discussing the Results of the Third Key Hypothesis

There is a statistically significant effect at the significance level ($\alpha \leq 0.05$) of the organizational support that recognizes the strategic entrepreneurship in its dimensions (entrepreneurial leadership, entrepreneurial culture, risk taking) in Anbar Health Directorate/Iraqi Ministry of Health. "The outcome of the third major sub-hypothesis indicates a statistically significant effect of the organizational support variable in strategic entrepreneurship, with a beta (B) value of (0.179) and a (t) value of (2.263) with a significance level of (0.024) which is less than (0.05).

Besides the value of the marker (R2) is (0.860), which means that the median variant (perceived organizational support) accounts for 66% of the variation in the dependent variable (strategic entrepreneurship), and these results are considered supportive of the studies of Khudayr and Ahmed (2017) and Giglioti et al. (2019).

9.5 Discussing the Results of the Fourth Main Hypothesis

There's a statistically significant effect at the significance level ($\alpha \leq 0.05$) for the requirements of high commitment management in its combined dimensions (normative commitment, job enrichment, job security) on strategic entrepreneurship in its combined dimensions (leadership, leadership culture, risk taking) through perceived organizational support in the Anbar Health Directorate/Iraqi Ministry of Health. The results showed a statistically significant effect of the organizational support variable perceiving the relationship between the requirements of high commitment management and the strategic entrepreneurship in both courses.

The first direct course: The direct course value of beta (B) is (0.672) and the direct course value of (t) is (9.748) with a significant level of (0.000) which is less than (0.05).

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The second indirect course: The significant values of beta (B) in the indirect course are respectively (0.730) and (0.179) and (t) values are (16.805) and (2.263) with a significance level equal to (0.000) for both courses less than (0.05).

These values indicate that the mediation resulting from the perceived organizational variable is considered to be a partial medium, as the results demonstrated a direct effect of the requirements of the high commitment management without the intermediate variable. However, the effect of the intermediate variable is positive, since the value of the coefficient of determination (R^2) prior to the intervention of the mediator (perceived organizational support) was (0.658); after the mediator's entry this percentage rose slightly by (0.02) This means that the variant of the requirements for managing the high commitment in its combined dimensions has come to explain (0.66) the variation in the dependent variable (strategic entrepreneurship).

Hence, the result is considered consistent with a study (Mansour & Ashour, 2016) that found a positive and significant effect between high commitment management and organizational commitment through perceived organizational support. Therefore, the research company must work continuously to improve employees' outcomes, especially the level of organizational commitment due to its positive effect on the organizational performance.

10 Recommendations

Based on the findings, this study recommends the following:

1. Formulating a future vision with a leadership orientation of the department depends on the requirements of high commitment management and how to recruit in operations to attract, select and recruit people who are able to explore opportunities and expected threats with the results of performance analysis to recognize and strengthen strengths and weaknesses to overcome them.
2. The directorate uses the quantitative and qualitative methods and resorts to numbers and statistics to put a clear picture of the future of the directorate within a scientific and practical methodology aimed at adopting appropriate methodologies for its working environment to achieve strategic entrepreneurship.
3. The need to invest the research directorate for high commitment management practices to enhance the perceived organizational support of the employees in order to keep strengthening the strategic entrepreneurship and distinguishing it from other organizations. it should realize the experiences of the developed countries in applying these practices to benefit from them in the best possible form.
4. The high management in the health directorate should develop the capabilities and skills of the service providers, take the interest of the service providers, increase organizational support for them and meet the expectations of the employees about attention to their personal needs, self-esteem and work efforts.

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Knowledge Management

Interdependencies and Integration of Smart Buildings and Smart Cities: A Case of Dubai

Mounir El Khatib, Gouher Ahmed, Muhammad Alshurideh, and Ahmad Al-Nakeeb

Abstract The literary meaning of the word 'smart' is bright, intelligent, high performing, which, by and large, is also true in the case of 'smart' buildings and cities. The present digital age (seems) to be a smart age and smart times, where everything is expected to be smart, including cities and their dwellings or buildings as living and working spaces. This study addresses Dubai, well known for its smart service initiatives, through Dubai Municipality (DM), and Dubai Electricity & Water Authority (DEWA). The Results reveal smart power and water management efficiencies and smart and effective delivery of civic services through the use of ICT. Dubai has plan to turn the sustainable city into power, water, infrastructure, information and communication efficient one by the 2021 Golden Jubilee year of the founding of UAE. The message of it is that the future is of smart dwellings and smart cities, and the concept of 'smart' in the case of ultramodern Dubai too should extend to the citizens.

Keywords Smart buildings · Smart Cities · Sustainability · Eco-system · Dubai

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_89

1 Introduction

To start with, a smart city is a community in which citizens, business firms, knowledge institutions, and municipal agencies collaborate with one another to achieve system integration and efficiency, citizen engagement, and a continually improving quality of life (Al Batayneh et al., 2021; Al Shebli et al., 2021; Ghazal et al., 2021a). The term Smart Cities or Digital Cities are urban development, with the help/aid of implementing information and communication technologies. They are cities of the future which are forward-looking and resource-efficient providing a high quality of life, and are innovative in respect of infrastructure and homes, offices, business premises, besides being energy efficient and nature friendly (AlSuwaidi et al., 2021; Madi Odeh et al., 2021; Taryam, et al., 2020). They are made-up of new energy and transport system. Government and public Partnerships are essential for smart cities, and to make the cities to be smart and intelligent, decisions need to be taken at the strategic level to see the decision makers' commitment to smart city development implementations (Aburayya et al., 2020a; Alhashmi et al., 1153; Kabrilyants et al., 2021).

The concept of smart building is elastic and evolving in a constant way. This flexibility supports the facility to add and insert various functions and components to smart buildings and smart cities programmes. Smart buildings are generally kept to be flexible, energy efficient, interconnected and automated to enhance comforts of life (Aburayya et al., 2020c; Alshurideh et al., 2016; Al-Zu'bi et al., 2012). "Smart home refers to an intelligent home concept in which the user can work on sensors and devices to make the house respond in a way to stimuli". Smart buildings have been of scholarly attention for over thirty years. The phenomena are present in almost every smart materials, smart detectors, and smart constructs, with the aim of creating efficient buildings, making use of advanced and efficient building construction technologies, as the 'green' one (Alshurideh et al., 2019a; Joghee et al., 2021; Lazaroiu et al., 2018; Shishan et al., 2022).

This paper review Smart Cities as the future of urban settlements, with large populations that require, first, smart dwellings make-up good city to live-in buildings block of smart cities. Smart Cities has an average technology size, sustainable, comfortable and also secure (Lazaroiu & Roscia, 2012). Dubai, which has reputation as an ultra-modern city (Aburayya et al., 2020b; Ahmed, 2021; Alzoubi et al., 2021; Krane & Dubai, 2009), is taken as a case study of the problem. A comparison made of 'dazzling' Dubai with other smart cities, to see how they differ Dubai, a city state of the Emirate is in part of the 7- emirate of the United Arab Emirates (1971), which has come to be an up-to-date state of the world. The basic question addressed in the study is whether smart buildings lead to smart cities?

The research objectives are to (i) define the constituents of smart buildings from both international and local point of view, and also (ii) to see whether smart buildings are enough to build a smart city or not, and (iii) to study Dubai's initiatives in this regard. And the study is organized around the following questions: (a) What constitutes a smart building? (b) Are smart buildings milestones that lead to smart cities? (c) Are smart buildings the only key component that lead to smart cities? (d) What is Dubai government's strategy and future plan towards smart buildings?

2 Literature Review

2.1 Smart Building

The concept of Smart Building has been in existence for about two decades by now. Its definition, as well as implementation, has been evolving and varied in line with development of knowledge and technology over the years. (Kroner, 1997) asserts that the contemporary smart buildings are ones that have been enhanced electronically. Accordingly, Smart Buildings can be defined as buildings that are capable of enhancing the productivity of their occupants, optimize environmental performance, enhance satisfaction and safety by promoting comfort and adopting morbidity and health features.

Arkin and Paciuk (1997) have suggested that the smartness of a building is not only based on the sophistication of the technology used but the integration that occurs between different systems. According to Atif and Galasiu (2003), the factors that influence the increased use of Smart buildings in the world and more importantly in the United Arab Emirates, (UAE) are ensuring cost effectiveness through cost reduction measures and enhancing the technological capabilities that characterize them (Aburayya et al., 2020d; Allozi et al., 2022; Nuseir et al., 2021a). Other major drives include industry and government sustainability policies, the need for intense security, the changing market trends in real estate, the ongoing business pressures, the triple bottom line requirements for reporting, the needs to outsource the building services and the shifting nature of work environments (Al Naqbia et al., 2020; Al Suwaidi et al., 1261; Alameeri et al., 1261). (Amponsah & Ahmed, 2017a) and other researchers further note that it is vital to analyze the drivers to determine the applications of technologies that would yield more beneficial results.

2.1.1 Features of Smart Buildings

- *The buildings are flexible:* The buildings make use of information collected from different sources to prepare for future events. They can adjust to their operations and physical nature so that they can suit these surroundings. A smart building can account for people's different needs and changes in occupancy rates (Akram et al., 2016).
- *Smart buildings have control:* They are either automated or possess human control. The buildings regularly warn occupants of the current temperature and direct them to their comfort areas.
- *Environmental preservation:* They use the real-time environmental information to guide the house owners on ways to preserve the environment. The buildings also have good sewage systems that ensure efficient disposal of waste.
- *Possess an enterprising feature:* The buildings make use of information gathered to advise visitors on the nature of a house. This enterprising nature makes a tremendous potential for the buildings to provide a comfortable atmosphere (Buckman et al., 2014).

- *The buildings are comfortable:* According to Das et al. (2015), the buildings have advanced technologies, which make the life of the owners easy. They have a remote control which helps the owners to perform their duties comfortably.

Smart buildings in sum are airy, bright, energy and water conserving. It enabled, light but should rowed attention, and social and environment friendly, well maintained and clean and green.

2.2 Smart Cities

The literature on Smart Cities includes a broad spectrum of multidimensional components and a diversity of conceptual relatives, as "knowledge-based development," "intelligent city," and "skilled cities," to name a few (Nam & Pardo, 2011). The term smart city covers a considerable ground and includes a range of concepts related to urban development conflated under the "smart" label (Hollands, 2020).

Chourabi et al. (2012) focus on smart governance, ICT, and/or smart people, while (Caragliu et al., 2011) a smart city has a progressive economy and outlook, ICT infrastructure, an attitude toward positive development, a focus on creative solutions to management complexity, and the use of technology to streamline city services. Further, a smart city must contain "a smart economy; smart mobility; a smart environment; smart people; smart living; and smart governance." Moss Kanter and Litow (2009) claim that all of aforesaid systems must come together to create an "organic whole," so that all elements of the city must function as a single network.

By the way, literally 'smart' means *Stylish,* up to date, (Webster Dictionary) by which smart cities are Bright and Stylish cities. Of course, every city, with the passage of time, has to get updated. For example, compare Dubai of 1971 with Dubai of 2019, between which there is a sea of difference. The opposite of smart is Dull, Faded. Dubai is said to dazzle its ever-flowing tourist visitors, who come in millions, to see the wonder city of the twenty-first century and shop to their hearts full or over flowing satisfactory. There is no doubt about Dubai being a very Smart City. What is more, it is credited with Smart and forward looking leadership (Moss Kanter & Litow, 2009), without which cities cannot take a smart shape.

All smart city working definitions include most or all of the attributes of sustainability, advanced information communication technologies (ICT), smart/good governance, and human capital development (Khatib et al., 2019). According to the researchers, the four principal elements that operate in an integrated way in smart buildings are actuators, sensors, performance models and integrated information management system.

A smart city is not only technologically savvy, but also culturally and intellectually oriented. It is an integrated and holistic city in which people love to live and work and indulge in some creative activity (Amponsah & Ahmed, 2017b). It, in a way, is of advanced global city, as one can easily visualize. In this respect, Dubai is an

established and acclaimed Smart City with a smart and dynamic and sophisticated feel-at-home tourism industry (Khatib & Ahmed, 2018).

2.3 Smart Buildings and Smart Cities Relationship

The influence of smart buildings in contributing to development of smart cities is visible in the ability of these buildings to accommodate a high number of residents and creating sustainable real estate solutions. Urban populations are constantly growing, requiring the application of information and communication technology to develop buildings that will offer improved quality as well as interactivity of services in urban regions (Intel, 2016).

Buildings interact with other economic, social, and environmental aspects in the community. For instance, buildings consume approximately two-thirds of electrical energy, therefore through installation of appropriate sensors, control systems and actuators electrical energy could be saved and environmental preservation would be achieved (Morvaj et al., 2011). Smart buildings are hence a significant influence in development of smart cities. The key elements that create a framework for a smart city include energy, water, waste, infrastructure, public safety, education, green buildings, transportations as well as citizen services and buildings are associated with a majority of these elements, illustrating the potential that smart buildings have in creation of smart cities (Doherty xxxx).

2.4 Information Technology and Urban Growth

The translation of a smart building acknowledges the need for an integrated and universal model. They are structures which combine and consider business management, intelligence, and adaptability, so as to meet the directors of development. Smart cities are urban growth insights to combine the Internet of things (IoT) and IT uniformly to handle a town's properties (Deakin, 2013). These resources may include schools, power plants, hospitals, and community services amongst others. The cities utilize IT to improve their effectiveness, connectivity, quality of work, costs decrease, resources use, and enhance the contact between the state and its nationals. IoT is developing a new range of smart buildings which are more aligned with the organizations' strategies (Ghazal et al., 2021b; Krane & Dubai, 2009; Lee et al., 2022; Nuseir et al., 2021b). It allows operational processes to produce precise and sufficient information for enhancing functions and offers the best to its clients.

2.5 The IT Alignment with Smart City Strategy

Information Technology is gradually transforming the cities across the globe, making the cities digital cities with swing on-line transitions. The internet is modifying the conventional urban strategy design and compelling developers to consider the utilization of IT to enhance the mobility, administration, finances, and the overall environment of a city. Even from the definition of the smart cities, IT plays a vital function in creating a city that is adaptable to the modern needs of its inhabitants. Further, IT offers a technology and trade review of the latest trends in logistics, water supply, and energy in urban developments (Khatib & Ahmed, 2018). Thus, IT appears to be the vehicle propelling the development of Smart Cities.

In the vital and worrying energy sector, 'smart power' relates to the any type of energy, whose purpose is to decrease energy losses, enhancing provider services, raise effectiveness, and reduce wastage. The plans rely on the advanced IT facilities and services. Smart logistics target information-grounded traffic regulation and people. This sector depends on smart transportation processes for the checking and management of the fleet and traffic services on real-time data basis. Smart water relates to the programs that aim at encouraging water conservation and efficient use of energy in the water arena by the implementation of the machine-to-machine tech, and data review.

In a firm where IT and business strategies are aligned, the organization understands the goals and objectives of the IT department and ensures every change takes into account the influence it has on this department (Alshurideh et al., 2021a, 2021b; Leo et al., 2021). The IT manager comprehends the overall aim and objective of the firm and thereby acts according to its terms. The misalignment of IT and business plan takes place when the firm never incorporated IT into the planning or has slowly become disconnected as the company's requirements and priorities evolved. As the modifications take place, most managers update their plans but fail to incorporate the effect of these changes to IT.

The supply chain, sale, and marketing departments may have evolved over a period. However, these changes usually occur with no observation of what IT must change so as to support such modifications. Similarly, technology changes at a high rate. Firms notice the significant capital input they made in particular technologies and are cautious to leave out legacy processes so as to favour new and outsourced services due to the increased costs and difficulties. Consequently, in such firms the conflicts arise as the business plans change and IT strategies remain stagnant or even worse. Now it is time to take up Dubai and its plans of Development, to make the city a more renowned global metro or mega-polis.

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2.6 Dubai Plan 2021

Dubai 2021 plan aims at ensuring safety standards within the built environment of the city. The plan focuses on guaranteeing building safety for the residents and visitors living in the city by offering disaster management responses. It also plans to provide high-quality housing, to all socio-economic groups. The plan involves integration of new technologies that ensure optimum facilities, and also focus on optimum energy management and sustainability, in all matters of the city development to put the stellar city on a for-ever smart footing. The buildings are also to be made ecosystem friendly, to ensure a clean and healthy environment. To be able to achieve the 2021 plan, Dubai needs to make sure that the buildings have no negative impact on their surroundings and that they maximize economic benefits of the city. Dubai Plan 2021 is an example of keeping the reputed city dynamically smart pleasing in appearance and most efficient in functioning and administration.

3 Research Methodology

3.1 Research Design and Data Collection

This research is descriptive research that uses the qualitative method for data collection to identify, categorize publicly available information about international Smart Cities including, Dubai and some others to compare their smartness in terms of building and other standards. Data collection was done through interviews, and Surveys, concerning select Dubai civic bodies of DM & DEWA.

3.2 Interviews

Person-to-person interviews of the head of each department (IT & Strategy) in both DEWA and Dubai Municipality Sr. manager, manager, sr. specialist level in the know-how of the City matter's as their administrators, in their organizations. They had provided with required amount of information for the study being experts in the current state of affairs and the plans Dubai plan 2021, the Golden Jubilee Year of founding the United Arab Emirates (UAE), by which date the Emirates, intend to 'achieve, say a very 'smart' high and steady state of development. Three questions were put to the heads in both the organisations, they are (a) What is DM's/DEWA Information Technology strategy? Especially in smart building field. (b) Do DEWA forecast or predict for future technology? How? (c) How they utilize future technology in their plans/projects? giving a good deal of information/Data. It is significant, Dubai's urban/municipal organizations and authorities operate on a minute state of Information. So, 'Smart' in the matter of departmental information.

3.3 Online Resources

The study had drawn from the DEWA and Dubai Municipality official websites for the organizations' initiatives and real projects. Also, other related websites to collect more data about the specified topics, which had got buttressed by articles and researchers have been used and utilized to support the research.

Even as it is Dubai seems to be a smart global city by appearances, and functioning, which doesn't mean it doesn't have un-smart features like over per capita water consumption. In a desert city like Dubai, water has to be used with utmost care and ZERO or near zero wastage Water is the nectar of life, it is needless to say.

3.4 Sample Interviewed Organisations (DEWA & DM)

3.4.1 Dubai Electricity and Water Authority (DEWA)

In 1992, Dubai Electricity Company and the Dubai Water Department were merged by the Sheikh Maktoum bin Rashid Al Maktoum, Vice President & Ruler of Dubai, to be Dubai Electricity and Water Authority (DEWA), the main provider of electricity and water service in Dubai. DEWA is one of the authorities that has e-Government service which provides the online users with up to date information. In addition, DEWA has launched three initiatives programs to effort sustainable development in Dubai as a part of smart Dubai initiatives such as connecting solar energy to houses and buildings, Smart Applications & your Home and Infrastructure and Electrical vehicles charging stations. It is important that these initiatives were quite ahead of them in the Arab World, by and large, and elsewhere too.

3.4.2 Dubai Municipality (DM)

Dubai Municipality is a government organization which provides municipal services. It is a well acclaimed municipal body. It is made up of 34 units under six sectors (Sector's of Engineering and Planning/Environment, Public Safety and Control Sector/Environmental Services and Public Safety Sector/Institutional Support Sector/Public Support Sector/Communication Sector and Society) with multiple authorities & responsibilities. The municipality's vision is "Developing a happy and sustainable city", and the mission is to plan, develop and manage an excellent city that provides the essence of success and sustainable living.—Dubai Municipality is considered to be one of the largest governmental institutions in terms of the services it provides and the projects it carries out, in the Emirate of Dubai and UAE.

3.5 Limitations

In spite of researcher's best efforts and the respondent cooperative, the study may have some limitations, which however do impact upon the soundness and Results. (a) Difficulties to get the required answers from the organizations in Dubai as the majority of projects are not announced yet. (b) Time limitation. (c) The Variety of the criteria that define and measure the smart buildings all over the "Smart cities" made the comparison a challenge. (d) Lack of enough research in this field, as most of the research are based on smart building from an environmental aspect.

4 Analysis and Results

By interviewing people from Strategy department in both DEWA and DM, it was found that the important part of any project is the strategy used to achieve the organizations' goals. The strategy is to primarily facilitate positive energy and by doing this DEWA and DM have provided a positive and optimistic work environment. In return they expect to enhance the people's happiness, and the individual happiness leads to corporate efficiency.

Just to give a glimpse, they have incorporated a library, nursery, cafeteria, outdoor jogging track, and lots and lots of green spaces. In addition, DEWA and DM pride them self on the implementation of technology to reach their goals. For example, as of 2017, DEWA had adopted Microsoft's HoloLens technology, which is absolutely ground-breaking. Through this piece of technology, DEWA will be able to efficiently boost its operations, and greatly improve overall productivity and increase the process of innovation. By doing all this, they are able to provide services, with maximum potential to their customers. Through this, DEWA is able to assert its position at international level, as an efficient electricity and water dispenser of world repute. It is noteworthy, both the Dubai Emirates and the Emirates aim at international working standards for their organizations, of which both DM and DEWA have proved themselves to service organizational of global distinction.

The DEWA and DM belief is that future planning is a must to the success of any project or any of its related task. With this in mind, 2020 is likely to be a challenging as well as a great opportunity moment for the United Arab Emirates. DEWA and DM have programmes that lay the pathway for the achievement of a smartest possible city of Dubai. For instance, in 2016, DM had implemented a'10-week' programme, during which a number of technologies were undertaken and implemented to open further strategies. This programme was also called the ExO Sprint Programme, meaning a quick results program.

IT manager at DEWA had discussed about Al Sheraa or 'The Sail' project to be completed by 2019. DEWA had planned to design the building solely based on solar energy as the future un-bounded energy was planned to be shaped as a sail to capture solar energy. It had plan to build a 'net zero' type building where the energy used will

be much lesser than that of a normal building. It was calculated and found that the building will be utilizing about 70 kWh/sq. This helps DEWA to achieve the vision of an environmentally friendly approach and innovative planning.

DEWA and DM's primary concept is innovation, which form a greater part of their vision. In relation to it, they had recently entered into cooperation with a number of companies from India. All these companies operate in the energy sector. It was all a part of the 'Dubai Clean Energy Strategy 2050'. Through this cooperation, a number of projects are kept in order, which would transform the United Arab Emirates to be the leading and the most environmentally sustainable country. For example, Al Sheraa is a huge and ambitious project, to be implemented by DEWA. But there are other projects in place, which aims at sustainability, and integration with innovation. DEWA had initially planned a project called the 'Mohammed bin Rashid Al Maktoum Solar Park', which is planned to achieve 100% completion by 2020.

These are all 'smart' energy initiatives and plans which are to give Dubai a smart energy city image, as the solar energy is the cleanest and near to nature energy. The project is a part of Dubai Clean Energy Strategy. With this, the Al Sheraa project is also a sustainable related project, as, control centre would help keep track of all the building systems and switch off lights and AC, when they are not in use. Sustainability and innovations take part of each and every aspect of a project of DEWA projects.

The finding of it is that the entities in Dubai are involved and aware of Dubai vision, which is building up of a smart Dubai City that stands out in the country of global smart cities, through the medium of ICT. However, surprisingly, ICT was found not involved the premier organizations business strategy. It is however, a different that the researchers had not gone into the Question of Smart staff.

From the interviews it was found that, the organisations were still not involving the IT in their business strategies. And, without IT, smart organizations remain a distant dream, with IT standing for 'smartness' as the smart phones.

Al-Sheraa Building—The Smartest and Largest Government building around the world. Al- Sheraa, in Arabic means 'The Sail'. The name has a close correlation with the structural design of the building which shaped like a sail, and is covered with solar panels to produce over 3,500 kilowatt hours (KW/h). In addition, the building using technologies such as, the Internet on Things, Big Data and Open Data, and most importantly Artificial intelligence (AI). These robots are helpful in a lot of operations within the building. An application is given to the employees, which advises them on the traffic condition, and also assists in the process of booking meeting rooms and parking spots. The Al-Sheraa building is essentially a Zero Energy Building, which utilizes a way less energy as compared to other city structures.

4.1 Smart Water Management

As said, water is a very precious gift of mother nature, which however is in a declining supply Dubai being a desert land, the water problem is very acute, with the problem

compounded by a meagre annual average rainfall of 80–140 mm (Sherif et al., 2014). With this, the need is for the Smartest water management of the expanding City's water resources.

The DEWA is at the Job of smart management of the city's water resources, wherein the role of the citizenry is very vital, as they need to cut down their excess per capita water use, which is noted to be the highest of any country in the world. Smart cities, whatever they are supposed to be first of all, call for smart citizenry. This give reference point, however, is seldom come across in the smart cities' literature. As such, more than anything else, smart people in the sense of socially very responsible ones, is the first requirement of Smart Cities.

Al-Sheera is minutely managed with the latest technologies, the model of which should extend to homes, offices, businesses premises and the whole city. Dubai Municipality Smart Buildings exercise is quite an elaborative one and is mostly technologically driven. Dubai Municipality, which is reputed municipal body across the world, 'smartness' pervades all the big building initiatives (7) of the Dubai Municipality. Infrastructure, communications, energy, health, waste material, elevators, printers, building management, security and safety. From all buildings appear to be independent, yet inter-connected, building system. They are like little islands is the smart sea of municipality.

Smart Buildings mean energy, technology, and environmental benefits smart buildings are, say, the way forward to smart cities. Smart buildings confer, on the whole environmental health, economical, and technological advantages on Smart Cities and thus help building up of Smart Cities. In other words, it is a wider public perception in Dubai that Smart Buildings are akin to the bricks that go into the making of the edifice of smart city. In a word, public perception in Dubai is well in favour of Smart Buildings through which Smart Cities is presumed to be next step. Dubai is felt to be on the road to a smarter future.

4.2 Dubai's March Towards a Smart Future

Dubai is on the way to a large-scale digital transformation. The goal is possible through the adoption of the approaches of cutting-edge digital transformation, information, and communication utilizations. Adjustments, in the policies as well as regulations facilitate the adoption of prompt technological advancements which together with societal revolution, enable infrastructures for the internet-based businesses as well as the creation of a knowledge economy are being restored. Dubai city intends to expand the usage of innovative digital means to achieve sustainability in development, and enhanced governance, and growth as well as public well-being.

The ambitious endeavour of Dubai entails the creation of a "smartest" and "happiest" city by 2017 (Alshurideh et al., 2019b; Alzoubi et al., 2020; Sherif et al., 2014). The achievement of their vision relies on the maintenance of the digital-age entrepreneurial approach to leadership, networked and collaborative style of governance. Other indictors can be a positive sign to put Dubai in the right way towards

smart transformation ICT infrastructure and economic development and business. Such an achievement can lead to the minimization of the future barriers together with the expedite efforts that facilitate the attainment of their ambitious goals of a 'Smart'/Smartest and happier/happiest city of international distinction and standing.

The strategic plan of digital or smartest city transformation comprises of six dimensions that include Economy, Governance, Environment, Living, Mobility, and People, and the areas of concern include the quality of life, lifestyle, ICT, communications, information, infrastructure, services, and people, together with the social, environment, sustainability, Governance and administration, economy and finance and Mobility and transportation (Sherif et al., 2014).

4.3 Dubai Plan Toward Transforming into a Smart City

The findings from reading and analyzing is explained in this part. Dubai plan 2021 to transform the acclaimed city of Dubai into a smart city by achieving several accomplishments. The plan is an output of the forward-looking government of Dubai, headed by very concerned leadership, which intends to put their Emirate of Dubai in the first ranks of the developed countries. The plan is a model of smart-city development (Sherif et al., 2014).

Firstly, Dubai plans on building an infrastructure, which will support the economy and social life of the city. The infrastructure will be wholly integrated and connected, to ensure easy mobility for the people in the city have access to the economic and social sectors.

Incidentally, 2021 is the Golden Jubilee year (50th) of the founding the new Arab state of the United Arab Emirates (UAE) (1971), which has achieved many records of development, in which Dubai as the second largest Emirate after Abu Dhabi has a stellar tale.

Secondly, it plans on ensuring that the city uses the available resources sustainably. Sustainability means that it must pay attention to the future by providing sound management and use of renewable energy sources.

Thirdly, it plans on ensuring a healthy and clean environment, to ensure sustainability of the city in the long-term.

Lastly, it plans on managing safe and resilient built surroundings. The program aims at making Dubai stand it on par with the world-class cities, where there are high levels of efficiency and facilities for future growth.

4.4 Comparison of Dubai and Singapore

Singapore recognizes the influence of smart buildings in contributing to the development of smart cities and smart nations, and in this regard, the country highly prioritizes integration of technological as well as automated systems in buildings

to enhance control and monitoring, in addition to energy saving and improvement of human comfort. Comparison of efforts and plans of Dubai Municipality and the City Council of Singapore illustrates that both bodies are focused on transforming the public sector. One indicator is the degree(s) provided for various Smart buildings initiatives. For instance, governmental buildings are provided 15 points in Dubai regarding installation and the same holds for Singapore.

However, Singapore's total building degree for governmental buildings is higher at 100, compared to 95 in Dubai. The inference is that Singapore's efforts and resources allocated to this initiative would be higher. In 2016, the Building Construction Authority (BCA) in the country of Singapore was signed a partnership agreement with Microsoft aiming to integrate technological and automated systems in 30 commercial buildings (Sherif et al., 2014).

Singapore', allocation of a higher degree to Industrial Buildings have implications for Dubai's efforts, because Dubai may fail to achieve optimal outcomes. By allocating 25 to 'total building degree', Dubai fails to transform industrial buildings entirely and since these buildings often consume high energy amounts, they need to be monitored in the same capacity (perhaps even more) compared to government buildings, public buildings or other building types, most variables significantly receive the same degree in both Dubai and Singapore, including Energy Control Systems (15), Security and Monitoring Systems (10) and Water Control Systems (10). While both Dubai and Singapore invest significantly on tourism and hospitality, the degree provided to Hotels and Hotel Apartments is higher (at 100) in Dubai compared to Singapore which has provided a degree of 90 to this building type. The inference is that Dubai's popularity as a tourism destination encourages the municipality to improve human comfort through transformation of Hotels and Hotel Apartments into smart buildings.

As per the rankings stats, infrastructure from Table 1, Dubai is doing better in terms of ranking, the ranking has improved from 43rd out of 118 in 2020 to 29th out of 118 in 2021 when it comes to smart city ratings, Singapore is rated higher when compared to Dubai in terms of Population, HDI, GNI per capita. Dubai Ranks 'BB' in Smart City Global Rating and Singapore holds the top position with the 'AAA' in the year 2020 (IMD Smart City 2021 Index). Dubai has to rise over its under ratings in respect of health, utilities, education, and public safety in its journey towards an Emirates future.

As per the rankings stats, infrastructure from Table 2, Dubai is doing better than Singapore when it comes to the development of smart buildings, Singapore is rated higher in smart health care delivery. Adoption of smart transport is higher in Dubai than in Singapore while adoption of smart technology seems to be higher in Singapore as compared to Dubai. Dubai, nevertheless, is rated lower when it comes to electricity, education and public safety as compared to Singapore (KPMG Revenue (Annual Report), 2017). Dubai Ranks 45 in in Smart City Global Ranking and Singapore holds the top position with the 1st Rank in the year 2019 (Sherif et al., 2014). Dubai has to rise over its under ratings in respect of health, utilities, education, and public safety in its journey towards an Emirates future.

Table 1 Dubai and Singapore comparison

Component	Dubai	Singapore
Population	2,880,000	5,940,000
HDI (2019)	0.890	0.938
GNI per capita (PPP $)	67,462	88,155
Smart city ranking (in 2021)	29 out of 118 (43rd in 2020)	1 out of 118 1st in (2020)
Smart city rating (in 2020)	BB	AAA
Factor ratings (Structures) (in 2020)	BB	AAA
Factor ratings (Technologies) (in 2020)	BB	AAA

Smart city index (2021)–All ratings range from AAA to D.

Table 2 Ratings

Component	Dubai (%)	Singapore (%)
Smart buildings	70	60
Smart urban health care	50	75
Smart transport	75	65
Smart technology	70	70
Tourism	75	60
Utility	45	50
Education	60	70
Public safety	56	70

Source KPMG Revenue (Annual Report 2017)

5 Discussion and Findings

From the theoretical data and the collected information, a smart building is a construction that takes advantage of improved materials and technology in structural terms, electrical systems, HVACR, plumbing, and appliances. The compilation of all these factors enables such a building to achieve a considerable amount of energy saving. Certain elements of these type of buildings are true and tried, a familiar example being weatherization. Other elements include new technologies in lighting among other aspects that are new to the market. Some largely depend on the availability of renewable energy. Landscaping is also incorporated with the inclusion of green walls and green roofs. Advanced systems of control connecting these buildings are yet another major element, which is a way to optimize savings. A smart building uses information technology in the integration of every aspect.

Smart buildings are the key ingredients to the creation of smart cities. As such, constructing a smart building in any city is a sure way of improving the citizen's quality of life. Improved quality, in turn, is the base of creation of smart cities. Smart

buildings enable a city to efficiently and frequently collect utility data. An example of this is replacing the tallying of the bills with smart meters to do the collection. Doing this would make the identification of patterns of usage and effectively plan the usage of energy based on the amount of demand. An efficient city regarding service delivery translates into saving of energy, simplified processes and thus the city can identify the capital expenditure that is more helping without the risk of breaking the budget.

As for resident happiness, a smart city program enabled by smart buildings can improve the lifestyle of residents more than any other initiative tailored towards a smart city. In the long run, residents are empowered with better working conditions, safer environment, which entitles them to do more meaningful goals in life through efficiency, comfort, and safety of the systems around them. This is aside from the happiness induced by belonging to a sustainable city that practices fair distribution of capital income over other important aspects of life such as education systems and economic growth.

Is Dubai in the right way to be a smart city? The finding from the research is that a smart city must create a high quality of life and possess sustainable economic development. Smart buildings, good infrastructure, digital technologies, good governance, sustainable environment and well-educated residents, characterize a smart city. In the 2021 Dubai Plan, the city aims at building an infrastructure that supports economic development. It plans on creating a sustainable setting with a clean and safe environment, good governance, educated individuals and a vibrant and rich culture. It is evident that Dubai is in the right way to be a smart city since its plan is in line with features of a smart city. The program focuses on creating a high-quality lifestyle for the people of Dubai and building a sustainable economy, which are the key determinants of a smart city.

The government of Dubai has a plan known as "Smart Dubai Gov or SDG" the main aim of which is to create the happiest and smartest city in the world. The mission of the government is to create and deliver a city that is smart, and of the world class. This includes smart services and infrastructure, which comprise smart buildings. According to the government, their end goal is not technology, but rather to create an extraordinary life quality. The goal is to create sustainability among the citizen residents and ensure visitors are satisfied and happy. The city is benchmarking itself against other similar cities geographically, socially, economically, and culturally to compete to be a global leader.

Smart buildings are, no doubt, the key component to the creation of smart cities. For instance, the power use in such buildings enables the balancing of electricity demand and supply. The advancement in these buildings can be said to be like having a brain; that can reconcile and balance competing interests like occupant comfort, minimize energy and get grid stability. All these factors make smart buildings the only and best factor to the realization of smart cities anywhere in the world. They are efficient in every aspect, majorly solving most of the issues that are currently facing many cities. The best thing about such cities is that they are automatic and so will need minimal training to operate on the systems to get the cities up and running. From the data analysis, Dubai has the qualifications and the ability to be a smart

city which however may need more efforts in some phases but with government's commitment and knowledgeable people the city can step forward to start more smart initiatives with supporting innovations and provide the needed technology.

But, there are certain hurdles in the way of realisation smart city goals by Dubai, such as the over-use of water and electricity and excessively taking to outsource ownership and use. For after all, it is citizens who make homes, cities and states. Hence, there is a need, above all, for 'smart' or public and nature minded citizen behaviour.

6 Conclusion, Recommendations and Policy Implications

6.1 Conclusion

The field of the smart buildings has grown worldwide, including the United Arab Emirates and its constituent emirate of Dubai. There are several activities, initiatives and real projects that reflect the growing interest and awareness of smart buildings in Dubai. Dubai's experience in the field is still in its early stages. Evidently, smart buildings are considered to be the cornerstones for successful smart city program. But the smart city programs are driven home to re-integrated to be effective and wholesome, as no price meal approach to the problem couldn't be well paying.

The benefits of smart buildings tap into the fundamental necessities of human life, such as safety, health, and energy, that culminate in the happiness of a city. Smart cities do not come without, substantial or capital expenditure on infrastructure, environmental, etc., which is justified in terms of its many benefits. Above all, for reducing global warming, the starting points of which are cities and their dwellings in whom a behavioural change is to be brought over.

In sum, Smart Buildings and Smart Cities are tidy, neat and green, well- functioning and well governed and orderly, advanced technologically, economically well off in which the residents are happy to live in and work. Dubai is inching towards to be the world's smarter city. However, Smart Cities, have also been noted to suffer from some wicked problems as acute class and housing differences (Colding et al., 2019).

6.2 Recommendation and Policy Implications

In the light of the results of this modest but significant exercise, the following suggestions are put-forth with policy implications.

- To start with, smart buildings as suggested by very concerned scholars should be built with advanced materials which are nature friendly and nanotechnology for energy and water use efficiency (Sherif et al., 2014).

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- While many cities can easily be labelled as 'smart' for adopting new technologies, what is more necessary is that to truly establish the smart factor in every building, we must take the right approach towards the construction of new buildings and the transformation of the existing ones.
- Find and Set international features or standardized criteria to define and recognize the smart buildings and smart cities.
- The planners must learn how to overcome the barriers that hinder the progress of building Smart Cities. The common hurdles are the limitations of the infrastructure, gaps between the technological potential and the developmental requirements, public concerns, policymakers', technological determinism, obsolete regulatory frameworks, the government silos, resistance to change, and capacity deficit.
- Align the IT plan with the business strategy to start smart buildings. Make managers understand the features and the future of the IT and the technology supporting the smart building infrastructures, for which the IT involvement in planning smart cities instruction is important.
- Government and higher political involve leadership in Building Smart cities is essential.
- Citizens and people who get the beneficial from smart buildings should be involve as well through public awareness and more involvement via social media.
- Support and educational facility are important to encourage innovators that new ideas and creative touches to improve the smart initiatives in the cities are aiming to be smarter.
- Smart Buildings and Smart Cities movement should be a people's movement, involving all sections of the people.
- There are 'wicked' problems of Smart Cities like the demolition of poor dwellings for the purpose of the high-rise buildings for the rich and super rich.
- Not the least, Smart Cites call for socially responsible citizens who are active in the city affairs.

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Dubai Smart City as a Knowledge Based Economy

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Abstract Innovation, emerging technologies and digitalization have significant impacts on personal, social, environmental, and business aspects. This study explores the initiatives taken by the United Arab Emirates (UAE) to accelerate its knowledge-based economy to ensure the best living experience for its people. Knowledge is the key factor in growth and labor market expansion where skills, knowledge, and experience possessed by individuals, are the driver of creativity and innovation, with dependence on information and communication technology (ICT) as an enabler. The UAE is moving towards a knowledge-based economy in order to maintain a diversified economy in line with "The Abu Dhabi Economic Vision 2030" which was launched in 2009. Through a systematic literature review, researchers have developed a perspective on transformation of economy and society through innovation, use of Information and Communication Technology (ICT), as well as government performance management frameworks. Theory of sense data, nomothetic explanations, predictive and prescriptive analytics, along with Smart Dubai as a case study, are used to assess the achievements, emerging trends and expectations of knowledge-based economy in the UAE. Smart Dubai is a unique example of a high-level quality system that strives towards making Dubai the happiest city on earth. Smart Dubai has been adopting many projects that enhance the life of people and support the

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_90

economy of the UAE. This study highlights the challenges related to the implementation of the Smart Dubai project. The study also provides a clear view of smart cities transformation into a knowledge-based economy and utilizes predictive and prescriptive analytics tools that can assist other researches in the future to improve and develop research regarding smart cities and gain a better understanding. Ten recommendations are made in this study, for the Smart Dubai to consider, in order to maintain high-quality performance and accelerate the transformation process of Knowledge-based economy.

Keywords Knowledge-based economy · Innovation · Analytics · Digitalization · United Arab Emirates · Sustainable development

1 Introduction

The OECD defines Knowledge-based economies as "economies which are directly based on the production, distribution, and use of knowledge and information" (OECD, 1996, p.7). In the Knowledge Economy (KE), possession, use, and transfer of knowledge is essential (Al Mehrez et al., 2020; AlMehrzi et al., 2020; Altamony et al., 2012; Shannak et al., 2012). So, it is imperative to combine and synergize people, knowledge and technology to facilitate enhancement of value addition at micro and macro-economic levels. Powell & Snellman (2004) defined knowledge economy as "production and services based on knowledge-intensive activities that contribute to an accelerated pace of technological and scientific advance as well as equally rapid obsolescence". According to (Powell and Snellman 2004; Obeidat et al., 2021; Alsuwaidi et al., 2020; Al Naqbia et al., 2020; Al-Dhuhouri et al., 2020), the main components of a knowledge economy include a greater dependence on intellectual capabilities than on physical inputs or natural resources, combined with efforts to integrate improvements in various stages of the production process, from the R&D lab to the factory floor to the interface with customers (Ahmad et al., 2021; AlSuwaidi et al., 2021; Harahsheh et al., 2021; Svoboda et al., 2021).

Technological advancements and Information and communications technology (ICT) largely effect the globalization and knowledge economy because of the imbalances, and instability (Aljumah et al., 2021; Alshurideh et al., 2014; Alyammahi et al., 2020; Alzoubi et al., 2020; Ammari et al., 2017; Suciu, 2004). Dahlman and Utz (2005) highlighted that a knowledge-based economy is successful when there is a link between industry, science and technology. The empowerment comes from increased lifelong and education learning with higher investments in software and research and development. The dissemination of knowledge and technology is important and requires the "knowledge networks and national innovation systems" (Chartrand, 2006). According to Brinkley (2006), knowledge economy is, when firms bring technology and talent to create wealth. Also, According to Ahmed and Alfaki (2013), a knowledge-based economy is wider than the new economy or high technology. The foundation of a knowledge-based economy is to create, disseminate

and use knowledge, and knowledge assets are given more importance than labor and capital assets. Social and economic activities reach to a very high level through the use of quality of knowledge.

The economic growth and competitiveness are added to the earlier definitions of knowledge-based economy (Huggins et al., 2014), which is the value addition to the science and technology, and also to the social, economic, and educational progress. In this context, (Skrodzka, 2016), suggested that the knowledge-based economy promotes innovation and entrepreneurship. Similarly, (Khanmirzaee et al., 2018), noted that science and technology parks play a major role in the development of technology and are able to boost the economic growth of countries. (Al-Gasaymeh et al., 2015, 2020; Assad & Alshurideh, 2020a; López-Cabarcos et al., 2020), study based on knowledge-based theory, organizational learning theory and dynamics theory, investigates how knowledge transforms into profitability, and their results show the importance of both tacit and explicit knowledge for achieving sustainable competitive advantages. According to LaFayette et al., 2019a, 2019b; Shah et al., 2021, 2020; Assad & Alshurideh, 2020b; Al-Jarrah et al., 2012), the world economy is passing through a major transformation from an industrial economy to a knowledge economy, rendering knowledge as a primary factor in the production.

This study presents the perspective of knowledge-based economy, predictive and prescriptive analytics, theory of sense data, and nomothetic explanations for Smart Dubai as a case study. The Smart Dubai case study was examined on three perspectives such as knowledge-based economy, the use of the analytical tools, and Dubai pulse initiative, and an insight was developed to examine the transformation of the UAE's economy to knowledge-based economy. Secondary sources data were collected from World Bank Report, Global Innovation Index Report, ICT-Global Competitiveness Index Report and websites of government of the UAE.

According to Snowdon (2015), 'Sense-data' is a modern term for a long-standing idea, earlier articulated in the language of 'ideas' and 'impressions'. "On the dominant use of 'sense-data' it stands for an entity present in perceptual (and other) experiences which fundamentally has a mental nature and possesses certain qualitative properties which the subject apprehends" (Snowdon 2015). Those authors who involved in the project use sense data to foresee challenges associated with the Smart Dubai project to make nomothetic explanations and to provide necessary recommendations.

Predictive analytics tools are used to analyze the current data available at the organization's databases to come up with certain conclusions that will assist the management to make decisions based on knowledge rather than speculations and assumptions. According to Gartner official website, predictive analysis "is a form of advanced analytics which examines data or content to answer the question "What is going to happen?" or more precisely, "What is likely to happen?", and is characterized by techniques such as regression analysis, forecasting, multivariate statistics, pattern matching, predictive modeling, and forecasting." (Gartner Glossary, 2019a).

Prescriptive analytics tools help to anticipate what will happen with the reason and the timing of the events in order to reduce future risks and make better decisions. According to Gartner official website "Prescriptive Analytics is a form of

advanced analytics which examines data or content to answer the question "What should be done?" or "What can we do to make it happen?", and is characterized by techniques such as graph analysis, simulation, complex event processing, neural networks, recommendation engines, heuristics, and machine learning (Gartner Glossary, 2019b).

Prescriptive tools applied for two approaches, optimization model and rules model. The optimization model chooses the best alternative or decision to maximize/minimize objective function under constraints. Optimization model is done through an analytical code using a software with constraints to optimize the planning, scheduling, and assigning limited resources to minimize the cost. For example, deciding on the best route for oil-transporting vehicles from the depo to the petrol station, the model will be based on many constraints like vehicle size, petrol type, destination, distance, driver and the expected traffic. The second approach is the rules model. This model uses the inputs, judgment and business rules to assign the best action. For example, providing customers with certain treatments or offers (Gartner Research, 2015).

2 Rationale and Objectives

UAE desires to maintain a diversified economy in line with "The Abu Dhabi Economic Vision 2030" which was launched in 2009 (Ahmed & Alfaki, 2013). It is obvious that the UAE is moving towards knowledge-based economy (Aswad et al., 2011). Accordingly, the Government of the UAE aims to build a knowledge-based economy with sustainability that will include process, product, and distribution technologies to meet the needs for the UAE economy diversification while overcoming any challenges or conflicts and acquiring all opportunities available during a knowledge-based economy transformation (Mina, 2014). There is a need for the use of the analytics tools to ensure that a knowledge-based economy adds value to the economy of the UAE.

Considering the initiatives taken by the government of UAE to transform its traditional oil-based (resource-based) economy to a knowledge-based economy, the main objective of this research paper is to assess the achievements, emerging trends and expectations of knowledge-based economy. It is also an objective to review the Smart Dubai project as a case study to foresee challenges and make recommendations to accelerate the process of its knowledge-based economy.

3 Knowledge Economy in Brief

Literature has outlined key characteristics of knowledge economy with a common thread that knowledge plays an important role in it. According to Karlsson et al. (2009), the Knowledge Economy's main characteristics are continuous increase in

knowledge investments such as education and knowledge production, and widening application of Knowledge for development, production, distribution, and use of goods and services. White et al. (2013) proposed open innovation, education, knowledge management, and creativity as characteristics for the knowledge-based economy. Similarly, Tapscott (2014), puts forth that knowledge is the basic production factor, knowledge economy is a digital economy and visualization plays an important role in the knowledge economy as major characteristics of the knowledge economy.

The particular nature and high quality level of the knowledge-based economy provides new prospects for companies, countries and local communities to create a proper environment for a sustainable development (Sirbu et al., 2009).

Knowledge-based economy and sustainable development are targeted by many economies worldwide. "Knowledge-based economy can promote sustainable development through innovation sustained by economic growth" (Jednak & Kragulj, 2015).

Researchers accept that knowledge economy includes the advancement of knowledge creation, diffusion and the positive effects on economy; hence, there is a need to measure the knowledge economy at the global level. To measure the knowledge economy, the World Bank has Knowledge Management assessment methodology, which is based on 109 items, and is used in 146 countries for performance measurements based on 4 pillars (Debnath, 2002; The World Bank, 2012).

The four pillars are grouped into two indexes: Knowledge Index (KI), which includes Education Index, Innovation Index and ICT Index and Knowledge Economy Index (KEI), which comprises of Economic and Institutional Regime Index and Education Index. These two KI and KEI are based on a scale from 0 to 10, whereas the 10 is the highest level (Chen & Dahlman, 2005; Sundać & Fatur Krmpotić, 2011). According to Parcero and Ryan (Parcero & Ryan, 2017), the four pillars of a knowledge-based economy are (1) information and communication technology, (2) education, (3) innovation, and (4) economy and regime.

4 UAE Economy

After its independence in the year 1971, the economy of UAE was mainly driven by oil and global finance for over three decades. Early in the twenty-first century, UAE started initiatives to diversify its economy to reduce its dependence on oil. One of the national priorities of UAE is to become a competitive knowledge economy, driven by innovation (Khatib & Ahmed, 2019). In 2014, H.H. Sheikh Mohammed bin Rashid Al Maktoum, Vice President and Prime Minister of the UAE and the Ruler of Dubai, launched the 'National Agenda' to guide efforts towards the country's Vision 2021, which is aimed to position the UAE among the best countries in the world by the Golden Jubilee of the Union in 2021. The agenda specified a wide-range of work programs centered around 6 national priorities and 52 National Key Performance Indicators (NKPIs). The third national priority of UAE is "Competitive

Knowledge Economy driven by Innovation", and the government is putting all its efforts to achieve it under vision 2021.

The UAE is known as a 'trailblazer' in the Arab World, setting pace to economic development in the Arab region through innovations and excellence, which is the watch-word of the country in any economic domain (Aburayya et al., 2020a; Ahmed, 2021; Amponsah & Ahmed, 2017a, 2017b). In fact, the UAE seems to be a Renaissance Arab State, standing for the Arab World's resurgence (Ahmed, 2018). The incredible economic development of the UAE is greatly due to its eminent leaders at the helm of the affairs of the state and their exemplary leadership (Aburayya et al., 2020b; Alzoubi & Ahmed, 2019; Khatib et al., 2019; Taryam et al., 2020).

The Nations vision 2021, in the golden jubilee year, intends to take the economy far to the ranks of the developed countries and world-class in every respect. The UAE had a population of 9.63 million and commanded a GDP worth of US$ 414.18bn in year 2018 from its $2 billion in year 1971, and mobile phone subscription of 208 per 100 people with around 99% internet users (The World Bank, 2019). It seems a fairy tale-like transformation, attracting tourists and shoppers not only from the Arab region but also across the world.

The UAE's economy has a dynamic change in all the indicators from 1990 to 2018, except the agricultural sector which is less than 1% of GDP and the fertility rate has decreased drastically from 4.5 to 1.5 births per women, which is due to the women participating in the UAE work force and the UAE's government encouragement towards the Emiratization. GDP has increased to about 8 times from 1990 to 2018. At present, the UAE is the third largest economy in the MENA region, after Saudi Arabia and Iran (The World Bank, 2019).

5 UAE Knowledge Economy

If KEI rankings of Middle East and North Africa (MENA) countries are compared in 2012 with respect to their ranking in the year 2000, it can be observed that 10 countries of the region have risen upward, whereas KEI rankings of 13 countries fell back. On the knowledge economy index, UAE stood the second-best ranked country in the MENA region after Israel, which slipped down 8 ranks in the past 12 years. Its leading position reflected strong performance on the pillars of innovation, education and ICT. Apart from the UAE, Oman, Saudi Arabia, Azerbaijan, Algeria and Tunisia had good performance on the KEI, as Oman climbed 18 positions, Saudi Arabia 26 positions and Azerbaijan 15 position, Algeria 14 positions and Tunisia 9 positions as compared to 2000. Since World Bank stopped publishing KEI ranking from 2012, the authors considered Global Innovation Index (GII) report to gauge the progress of UAE on knowledge-based economy.

The GII ranks the innovation performance of nearly 130 economies around the world. Since 2011, Switzerland has ranked 1st in the GII ranking every year. UAE was ranked 47 in the year 2015 and has improved to 36 in the year 2019. In North America, U.S and Canada ranked No.1 & No.2, in Europe Switzerland, Sweden and

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Netherlands ranked 1, 2 and 3, whereas in Northern Africa and Western Asia, Israel, Cyprus and the UAE ranked 1, 2, and 3 respectively. The UAE achieved good success in knowledge utilization due to availability of technological infrastructure and moved up 6 points towards knowledge-based economy (Dutta et al., 2019), as it had one of the strategic goals to expand in the non-oil sector with diversification strategies for competing with emerging markets (Mehmood et al., 2019). Furthermore, it has also been observed in the report that the UAE produce lower level of output relative to their innovation inputs and comes under below expectations for level of developments under high income category.

It can be noted that, UAE needs to focus on improving its ranks on business environment, knowledge workers, knowledge creation and knowledge impact, which are key pillars of knowledge-based economy.

6 Case of Smart Dubai

Smart Dubai was first established in 2000 and was known as Dubai e-Government until 2013 when H.H Sheikh Mohammed Bin Rashid Al Maktoum changed its name to Smart Dubai government department. The vision of Smart Dubai is aligned with the vision of H.H Sheikh Mohammed bin Rashid Al Maktoum to make Dubai the happiest city on Earth and since then Smart Dubai has been pioneering smart city solutions and has been focusing on transforming and empowering Dubai through disruptive innovative initiatives, large scale projects by collaborating with the public and private sector, leading technological projects and many other initiatives (Smart Dubai, 2019d).

Smart Dubai has several initiatives that made a big impression regionally and even globally.

- Dubai Paperless initiative targeted towards the environmental sustainability aspect to preserve the environment by making Dubai a fully paperless government where governmental departments will no longer issue or ask for any papers or printed documents to be handed over across all operations (Smart Dubai, 2019c).
- Artificial Intelligence Ethical toolkit that includes the guidelines, self-assessment tool for developers, ethical considerations and common agreements. This initiative is targeted toward government entities, private sector, and individuals (Smart Dubai, 2019a).
- Dubai Blockchain Strategy project, which is a joint initiative between Smart Dubai and the Dubai Future Foundation that will lead the introduction of the blockchain technology in Dubai which is expected to "unlock 5.5 billion dirhams in savings annually in document processing alone" according to smart Dubai official website (Smart Dubai, 2019b).

Smart Dubai had a particular initiative called Dubai Pulse, which is a platform designed to provide all stakeholders, including government entities, private sector,

and entrepreneurs, access to one location of shared open data. This initiative includes core analytical services as well as big data services that can be used by various entities to enhance the living conditions and the economy in the UAE by promoting the vision of making Dubai the smartest and happiest city on earth.

The following insights are developed from the Smart Dubai Case Study;

1. Smart Dubai is supporting the knowledge-based economy through empowering the government entities with the technological tools and the reliable infrastructure of data sharing, storage, processing, and visualization. This enables the government entities to make better knowledge-based decisions in order to serve the society more efficiently and effectively.
2. Smart Dubai is focused on building collaboration between the public and the private sectors to achieve several targets like smart transportation, smart society, smart economy, smart governance, and smart environment.
3. Smart Dubai has released the data law in 2015 "Law No. (26) of 2015 on the Organization of Dubai Data Publication and Sharing" (Data, 2019), which makes Dubai the first city globally to release a Law to state guidelines for sharing data between government entities and the open data available for the public.
4. The Dubai Data initiative will benefit the city by "increasing efficiencies in spending, job creation and innovation investment enhancement through creating new products and services and raise the level of citizen engagement. These benefits promote government transparency and the ultimate happiness of Dubai residents and citizens" (Pulse, 2016).
5. The main challenge that Smart Dubai is facing with building a knowledge-based economy, is the culture as people relay on printed papers and the usual routine to perform tasks. Providing tools that can replace people jobs can make some people feel uncomfortable.
6. Smart Dubai vision is to make Dubai the happiest city worldwide, although it may seem simple but it is rather a large scope and challenging vision as stated by Hamarneh (2019).
7. The Artificial Intelligence (AI) initiative by Smart Dubai that is considered as a predictive analysis project, which is used by Smart Dubai. According to Hamarneh (2019), this tool can be used in so many ways like:
    a. An AI service that will match children to schools, so it will make it easier for parents to choose the right school for their children, and reduces the burden of this task on parents.
    b. Another AI application is at Dubai Customs where thousands of containers are arriving to the port every day. AI will help them to decide what to inspect and why and when by analyzing the volume, history and country the container came from.
8. The AI can be of a great use in reducing or automating the repetitive tasks, like validating customer papers or the inserting of forms information or detecting certain trends that will enable the government entities to perform better.

9. Smart Dubai does not apply the prescriptive analytics tools, although (Hamarneh, 2019) mentioned that applying these tools can be of a great benefit to the government and help them in making better decisions that will lower the cost, and enable them expect the demand through supply and demand mathematical modules.
10. Dubai pulse is an initiative provided to all stakeholders to make different analytical tools by the different data sets available for the use of the public that are regulated through Dubai data law. Many government entities are participating in this platform like Dubai Customs, Dubai Municipality, Dubai Silicon Oasis Authority, Department of Dubai Economic Development, Roads and Transport Authority (RTA), Dubai Health Authority and many other departments.
11. Dubai Pulse provides different data views like city flow, property land distribution, people flow, and property buildings distribution. These data views are available to provide stakeholders with insights through interactive displays to enhance the stakeholder's decision-making process and create business value. Therefore, building a better knowledge-based economy (Pulse, 2019).
12. Smart Dubai project is basically an Information Technology enabled Services (ITeS) to stakeholders and need to be examined on its sustainability. The project needs to be viewed on six indicators to measure e-environmental sustainability performance of ITeS organizations, based on consumption rather than cost as suggested by Yadav et al. (2017).

Therefore, it is obvious that Smart Dubai is a unique example of a high-level quality system that strives towards making Dubai the happiest city on earth. Smart Dubai has been adopting many projects that enhance the life of people and support the economy of the UAE (Aburayya et al., 2020c; Al Batayneh et al., 2021; Al Shebli et al., 2021; Taryam et al., 2020). One of the main projects that Smart Dubai has initiated is the Dubai pulse project which is a platform to gather different data and visualize it in data views. This project is considered as a descriptive tool of data analytics, which can later be used for predictive and prescriptive analytics to assist in the decision-making process of the various stakeholders. Another project is the Artificial Intelligence and machine-learning project, which is a form of the predictive analytics tools, this project aims to eliminate any repetitive tasks and optimize the resources in order to provide better services for the citizens. As the use of the analytical tools can aid in the decision-making process on different managerial levels, hence establishing better services for the citizens and building a knowledge-based economy. Smart Dubai has successfully established a collaborative data platform but still needs to establish projects that will have the different forms of the analytical tools like regression analysis, predictive modeling, pattern matching, data mining and machine learning.

6.1 Challenges

The implementation of the tools in the government can encounter many challenges concerning infrastructure as well as the issue of technological compatibility. Some of the key challenges related to the implementation of Smart Dubai project are;

- Successful implementation of the tools depends on purchasing and deploying software for analytics. It also requires the engagement of the right people and processes to leverage, implement, maintain, and govern the models and tools.
- Government data is scattered across many departments making the gathering process a challenging task for the smart government. Furthermore, it can also be challenging to decide on what is actually important from the massive amount of data.
- Government data can consist of unneeded and redundant data and, therefore, cleaning and reconstruction of data will be required.
- The data available can consist of different data formats or still manual paper information or even scanned documents with no stored fields making it hard to rely on for analytical tools.
- The models that are generated from the analytical tools must be embedded in the operations and in the decision-making process to utilize their benefits.
- Testing and validating the models, based on different scenarios, can be time consuming and strenuous.
- Changing the culture and mentality of the people also can be considered as a challenge. Shifting from the regular decision-making process to advanced analytics tools can be challenging and requires a lot of change management.
- A systems approach to management of innovations in supply chains has two categories (value chain and supply chain) and has six levels. These levels of innovations are interlinked with different actors in the supply chain and different functions of value chain. The role of each actor in the supply chain for respective levels of innovations needs to be identified, incubated and managed professionally to utilize the benefits for growth and success (Gupta, 2013).

6.2 Global Cases

The advanced analytics tools are still considered as a new technological advancement; however, many governments and companies have decided to add the use of the tools to their strategies. The following cases can be compared with the case of Smart Dubai.

- A successful implementation of the advanced data analytical tools at US Immigration and Customs Enforcement (ICE), to manage the overseas offices effectively. The ICE manages more than 60 field offices in 45 nations. Until 2014 the decisions of choosing the ICE international offices were made based on subjective evidence or periodical surveys. However, in 2015 they decided to use the data of

the workloads and the activities of the offices to decide on where to expand or where to shut offices without affecting the mission performance (Kelkar et al., 2016).

- Another case to benchmark with is the Virginia state case in building an integrated system for benefits eligibility of medical assistance. The offices that processed those applications were often understaffed and overloaded with work. However, in 2015, Virginia Department of Social Services (DSS) decided to take a different approach in addressing this problem. The information was gathered and analyzed by the use of the analytical tools to identify issues in processing the applications and, therefore, enabling the DSS to provide better social services to the citizens. (Kelkar et al., 2016).

7 Recommendations

Insights developed in the case study in the field of smart cities, may help and support other cities to become smart, discuss the conflict, challenges and opportunities of knowledge-based economy and add value to their economies. It also provides a clear view of smart cities transformation into a knowledge-based economy in addition to using predictive and prescriptive analytics tools that help other researchers in the future to improve and develop studies regarding smart cities and get a better understanding. The following recommendations are made to the Smart Dubai to consider in order to maintain the high-quality performance and accelerate the transformation process of a Knowledge-based economy:

- It is important to establish an information system and a collaborative platform of data for digital transformation of a smart city.
- Increase the utilization of technology in order to improve the economy.
- All stakeholders should be engaged in the transformation to smart city and the building of the platform for analytical tools.
- Create a roadmap to have a successful use of the analytical tools by monitoring, experimenting and implementation of these tools.
- Increase investments in education, technology and communication in order to achieve competitive advantages against other economies regionally and globally.
- Focus on training programs for employees to develop, improve and enhance their skills and experience.
- Train the government sector leaders on the new data analytics and how it can boost and sustain the economy.
- Identify the obstacles that are preventing the government from using the full potentials of the disruptive innovations.
- Establish a policy and a foundation of security, and accountability that protects privacy and promotes digital ethics.
- Identification of the most important data relevant to the decision-making process and the elimination of redundant and unneeded data.

8 Conclusion

Due to strong competition between cities and economies worldwide, Dubai's economy is perceived to be an exemplary example. His highness Sheikh Mohammed Bin Rashid Al Maktoum Vice President and Prime Minister of UAE, and Ruler of Dubai, envisioned economy of the UAE to be transformed from oil-dependent economy to a knowledge-based sustainable economy with the use of innovation and technology, and the creation of knowledge. Several initiatives in the UAE in general, and particularly in Dubai, made the economy of UAE stable and more flexible. The strategies of His Highness attracted some of the best and largest organizations, from different industries worldwide, to invest in Dubai in order to make it the best city in the world as well as the happiest city on earth by leveraging emerging technologies such as Blockchain, Artificial Intelligence, along with harnessing Data Science capabilities (Alshurideh et al., 2020, 2021; Alzoubi et al., 2021; Dubai, 2021; Ghazal et al., 2021; Joghee et al., 2021; Naqvi et al., 2021; Nuseir et al., 2021a, 2021b). Since the world bank stopped publishing reports on knowledge economy index, countries performance on KE parameters are now gauged from other international reports and indices. The UAE is ranked 36 globally, in the Global Innovation Index (GII) report in the year 2019, 2 ranks above from its position in the year 2018. UAE enjoys the first rank globally in the rate of mobile-broadband subscriptions, rate of the population covered by a mobile-cellular network, as well as the population covered by at least a 3G mobile network as per the Global Competitiveness Index, published by the International Telecommunication Union (ITU) in the year 2018. The UAE also ranked second in Mobile-cellular subscriptions, fourth in the rate of households with a computer, seventh in rate of households with Internet access at home, and eighth in internet users globally (TDRA, 2018). The UAE with such an excellent ICT infrastructure and, over 90 percent of expatriate population from all over the world as users and contributors to the economy, is an ideal setting that should to be utilized for accelerating knowledge-based economy with the use of predictive and prescriptive analytics tools and strong support from the government.

To accelerate the transformation process of knowledge-based economy, the UAE needs to improve its ranking on business environment, knowledge workers, knowledge creation and knowledge impact.

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Impact of Organizational Learning Capabilities on Service Quality of Islamic Banks Operating in Jordan

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Abstract The major aim of the study was to examine the impact of Impact of organizational learning capabilities on service quality. Therefore, it focused on Islamic banks operating in Jordan. Data were primarily gathered through self-reported questionnaires creating by Google Forms which were distributed to a purposive sample

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_91

of managers via email. This study was conducted using structural equation modeling (SEM) to test hypotheses. The results show that interaction with external environment has the highest positive impact relationship on service quality. Upon study findings, the researcher recommends managers and decision makers to invest the human element continuously by involving them in the decision-making process to acquire administrative skills along with technical skills they already have.

Keywords Organizational learning capabilities · Service quality · Islamic banks · Jordan

1 Introduction

Organizations operating in the local and global fields of all sizes and activities face great challenges in a competitive world, and the rapid change of the client's wants (Al-Hawary & Al-Syasneh, 2020). Organizations tended to race to invest in information technology in order to enable and enhance the organization's ability to learn, in order to reach and satisfy customer expectations; the thing which is reflected in achieving the organization's goal and then survival and stability in a rapidly changing environment (Al-Hawary & Ismael, 2010; Al-Hawary & AlDafiri, 2017; Al-Hawary et al., 2018; Al-Hawary & Al-Hamwan, 2017). Learning is an effective tool to achieve strength and survival for organizations in light of the information revolution that the world is witnessing, and it is a basic requirement for the success of any organization nowadays (Al-Hawary, 2015; Al-Hawary & Aldaihani, 2016). Lukas (1996) shows the importance of organizational learning by saying that "Organizational learning is the key to future organizational success". Therefore, organizations need to increase the pace of organizational learning to be able to keep pace with the massive changes in the contemporary business environment, and to achieve this, it needs more modern ideas and concepts (Al-Hawary & Al-Namlan, 2018; Al-Hawary & Alwan, 2016; Al-Hawary & Nusair, 2017). It also needs to innovate products and modern techniques in training the human resource and encourage innovation and creativity during work, and organizations are now dealing with human resources as mental and intellectual energy, a source of information and knowledge, and innovation and creativity (Alshurideh et al., 2019a, 2019b; Al-Hawary et al., 2020; Al-Hawary & Al-Rasheedy, 2021; AlHamad et al., 2022; Alshurideh et al., 2022; Shamout et al., 2022).

With the continued fierce competition in the market, the quality of service has become an essential factor in maintaining competitive advantage (Alzoubi et al., 2020; Alshurideh, 2022; Hasan et al., 2022) in addition, it is an urgent and necessary need to establish and maintain customer satisfaction. And according to Mansour the quality of service is an essential approach to total quality management. Service quality has become the focus of many organizations due to the increased intensity of competition, especially between service organizations, and because the purchase

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decision has become more complex (Aburayya et al., 2020a; Alshamsi et al., 2020; Alshurideh et al., 2019a, 2019b; Zu'bi et al., 2012). Despite the importance of service quality, there is a difficulty in evaluating service quality compared to goods (Parasurainan et al., 1985) because it varies with different people and times, in addition to the fact that the service is intangible. Therefore, this study came to test the impact of job satisfaction between organizational learning capabilities and service quality in telecommunications companies in Jordan.

The issue of service quality is one of the topics that preoccupied researchers in accessing practical and conceptual models through which organizations can reach an actual reality of quality commensurate with market requirements, as there are many models for measuring quality that differ according to the environment and activity (Metabis & Al-Hawary, 2013; Alshurideh et al., 2017; Alolayyan et al., 2018; Al-Nady et al., 2016; Al-Hawary & Metabis, 2012; Al-Hawary & Hussien, 2017; Al-Hawary & Harahsheh, 2014; Al-Hawary & Abu-Laimon, 2013; Al-Hawary, 2013a, 2013b). Moreover, the increasing in intensity of competition is a result of globalization and the rapid development of information technology, and the huge diversity in the number and methods of providing the service, the thing that reflected in the organizations' abilities to strive towards continuous improvement in the quality of their services, to reach a high level of the quality of their services, which is reflected in their abilities to improve the level of their customer satisfaction, in order to maintain their customers and increase their market share (Abbad & Al-Hawary, 2011; Abu Qaaud et al., 2011; Al-Hawajreh et al., 2011; Al-Hawary et al., 2012; Al-Hawary, 2012; Al-Hawary, 2013a, 2013b; Al-Dmour et al., 2021; Alzoubi et al., 2022).

2 Theoretical Framework and Hypotheses Development

2.1 Organizational Learning Capabilities

Learning carries multiple factors of human activities, these factors prompted researchers to discover what is called organizational learning in contemporary organizations. Like any system, learning is a vital process that helps the growth and development of the organization and increases its organizational abilities; accordingly, learning refers to the organized transformation in the behavior of organizational groups from old procedures to others with competitive priority.

Researchers and practitioners have been paying close attention to the topic of organizational learning since the end of the 1970s, this revealed to the research the organizations' interest in new competitive methods that help them to survive in the markets and adapt to environmental changes in order to perform their work related to information technology and modern knowledge. Communication in the learning process is the main source of sustainable competitive advantage in light of the changing environment conditions (Al Kurdi et al., 2020; Alshurideh et al., 2020; Ashal et al., 2021). If the organization wants to raise its level of performance, and

accordingly, organizations will not be able to achieve that goal except through human staff capable of learning and willing to learn, only then will they be able to succeed and adapt to the renewable environment variables.

How can the organization today achieve competitive advantage? In light of the great competitive challenges faced by organizations, the answer is the organization's ability to learn enables it to achieve competitive advantage, therefore learning is an effective tool that gives strength and survival to organizations, it also is one of the basic requirements for the success of any organization these days, Lukas (1996) says that organizational learning is, according to many researchers, the key of organizational success for the future, emphasizing the importance of organizational learning.

Organizational learning is one of the dynamic capabilities of the organization, through which human resources can absorb strategic knowledge in a way that enables them to improve their conditions and competitive position. Organizational learning capabilities represent the organization's ability to extract knowledge to implement strategic actions and then benefit from that knowledge when needed in order to adjust the organization's strategy. (Thite, 2004) confirms that organizational learning is a tactic aimed at learning dynamic capabilities, and (Garcia et al., 2006) confirms that implementing organizational learning processes provides the organization with a series of mechanisms that lead to many benefits such as outperforming organizational performance and increasing its competitiveness. (Berghman, 2006) said that organizational learning leads to an Increase in the dynamism of organizations and increase strategic innovation initiatives.

Learning capabilities have developed to become one of the most important managerial topics, The term organizational learning capabilities is influenced by a number of fields such as: organization theory, production management, strategic management, and management science (Beheshtifar et al., 2012). The learning capabilities encourage the organization and organizational process to learn effectively (Ahmed et al., 2011), it also increases organizational knowledge.

Researchers addressed the concept of organizational learning in different ways, and according to researchers and the models used, the concept of organizational learning differed among them, and by reviewing the management literature, the researcher did not find a unified definition of organizational learning capabilities, although many studies have dealt with this term, researchers didn't agree on a specific definition, Yueh defined organizational learning as: a process an organization undertakes to acquire and develop knowledge, this process has four basic components that are: getting knowledge from its sources, distributing information to those who deserve it, translating information into useful sentences, and finally storing it in the organizational memory. Tohidi and Mandegari (2012) referd to organizational learning capabilities as organizational and managerial characteristics that facilitate the process of organizational learning and allow the organization to learn, while Bahadori et al. defined organizational learning abilities as a set of tangible and intangible resources and tasks necessary to achieve competitive advantage, (Rashidi et al., 2010) considers organizational learning capabilities as an evidence that confirms the

organization's ability to create and integrate ideas in a distinctive way and the ability to communicate with organizational boundaries using creative management methods.

From the previous argument, a definition of organizational learning capabilities can be deduced which is a group of managerial and organizational components (tangible and non-tangible) that plays an important role in the organizational learning process and encourages the organization to learn greatly. Organizational learning capabilities play an important role in helping an organization learn, and therefore improve the organization's performance, and helps it to achieve a sustainable competitive advantage, plus a lot of reasons, Bess et al. (2011) pointed that organizational learning capabilities can be measured in seven dimensions represented by knowledge sharing, dialogue, participation in decision-making, managerial commitment, expertise and openness, knowledge transfer, and risk, as every one of indicated (Alegre & Chiva, 2008; Goh & Richards, 1997; Jerez-Gomez et al., 2005; Onağ et al., 2014).

The organizational learning capabilities are represented in eleven dimensions, which are: Openness and interaction with the external environment, experimentation, managerial commitment, participative decision making, empowerment and leadership commitment, clarity of purpose and vision, knowledge transfer and integration, work teams, dialogue, risk taking, and systems perspective. While Chiva and Alegre (2009) pointed out that organizational learning capabilities are represented by five dimensions, which are interaction with the external environment, experience, participation in decision-making, dialogue, and risk-taking. External environment, experience, participation in decision-making, dialogue, and risk-taking.

Experimentation: Many researchers have relied on experimentation as a dimension of organizational learning capabilities (Nevis et al., 1995), Alegre and Chiva defines it as "the extent to which suggestions and new ideas are presented and how to deal with them." Researchers assured that experimentation guarantees that the organization comes up with new ideas, clarifies how things work, helps to make changes in work procedures, and suggests innovative solutions to problems, based on the use of clear methods and procedures (Garvin, 1993). Mat and Razak (2011) sees that experimentation results in ideas flow and proposals that guarantee a change in the existing system, so that experimentation is a symptoms of the creative environment. Accordingly, management should encourage and support freedom to conduct experiments using new and innovative methods of work (Garvin, 1993; McGill & Lei, 1992).

Risk Taking: Taking risks is one of the organizational learning capabilities dimensions, as many researchers addressed (Onağ et al., 2014). Risk taking is the degree to which ambiguity, uncertainty, and error are tolerated (Chiva & Alegre, 2009). And Liles defined risk taking as futile probability outcome due to different procedures. The business organization is supposed to encourage risk taking and accept mistakes (Rafiq et al., 2011).

Interaction with the external environment: interaction with the external environment dimension represents one of the organizational learning capabilities dimension that many researchers have included in their studies (Bess et al. 2011; Onağ et al., 2014; Alameeri et al., 2020) and Chiva and Alegre (2009) defined interaction with

the external environment by the extent of which organization's interact with the environment and its adaptation to changes and the ability to influence the environment requirements." Environmental characteristics affect the learning process relationships therefore communication with the organizations external environment are important, especially with changing environments.

Dialogue: Researchers such as Bess et al. (2011) and Alegre and Chiva (2008) saw that dialogue as organizational learning capabilities dimension and a tool to provide communication and collective learning within the organization and between groups, dialogue has become an important process in business organizations as an aspect of understanding difficulties and possibilities of learning and change (Gear et al., 2003). Organization good communication network enhances learning as it provides an entrance to the appared knowledge, which in turn leads to new knowledge. Communication between management and workers allows for knowledge development and increase experience within the organization.

Participative decision making: Participation in decision-making is one of the organizational learning capacities as discussed by researchers (Alegre & Chiva, 2008). The process of giving employees the opportunity to participate in decision-making contribute to improve quality of the decision (Cotton et al., 1988). As it is considered as an incentive for employees, and involves achieving job satisfaction and employees organizational commitment (Daniels & Bailey, 2012).

2.2 Service Quality

Due to the competition intensity between service organizations and the fact that the purchase decision has become complicated, in addition to the increase of technological development that has helped organizations to provide electronic services with traditional service, organizations has increased its interests in service quality concept. Despite the service quality importance, there is a difficulty in evaluating it compared to goods (Parasurainan et al., 1985) because it varies according to people, time and place, in addition to the fact that the service is intangible (Al-Hawary & Al-Syasneh, 2020; Al-Hawary et al., 2017; Al-Hawary & Al-Menhaly, 2016; Al-Hawary et al., 2011)). There are many definitions of the concept of service quality; Where Gefan (2002) defined service quality as customer's subjective comparison to find the differences between the wanted service characteristics and the actual provided service. Parasuraman et al. define service quality as the comparison made by the customer between the current experience of receiving the service and the previous experiences of obtaining similar services. Also, Lehtinen and Lehtinen (1982) emphasized that service quality got three dimensions: physical quality, which focuses on the organization equipment and buildings, interactive quality, which result from organization employees and customers interaction that provide services, and organization quality, which is similar to organization image dimension that we referred to earlier. On the other hand, Parasurainan et al. (1985) detailed ten dimensions of service quality:

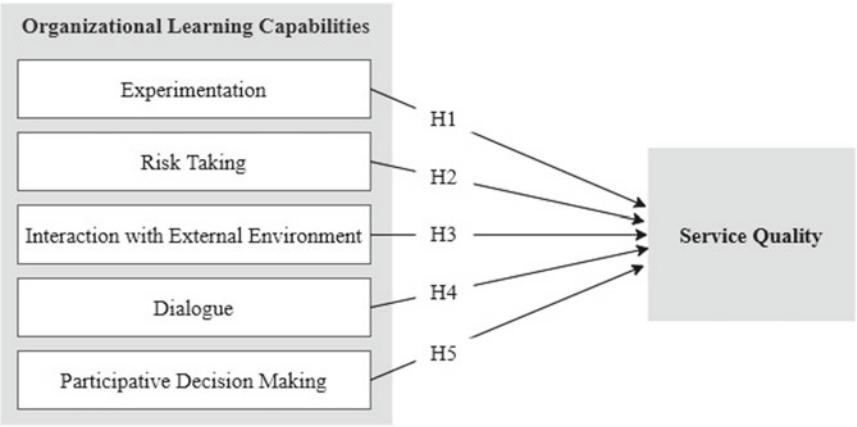

Fig. 1 Conceptual model

reliability, empathy, responsiveness, credibility, access, communication, courtesy, safety, tangibility, and the ability to understand the consumer.

Parasuraman et al. developed a 22-item tool to measure service quality, and when filtering service quality determinants, it now includes only five dimensions: tangible things, credibility, response, safety, and empathy, which is the individual care and attention that the organization shows towards its customers.

3 Research Model

See Fig. 1.

H1: There is a statistically significant impact of Organizational Learning Capabilities on Service Quality of Islamic banks operating in Jordan.

4 Methodology

4.1 Population and Sample Selection

A qualitative method based on a questionnaire was used in this study for data collection and sample selection. The major aim of the study was to examine the impact of Impact of organizational learning capabilities on service quality. Therefore, it focused on Islamic banks operating in Jordan. Data were primarily gathered through self-reported questionnaires creating by Google Forms which were distributed to

a purposive sample of managers via email. In total, (392) responses were received including (17) invalid to statistical analysis due to uncompleted or inaccurate. Hence, the final sample contained (375) responses suitable to analysis requirements, where it proved to be sufficient to the extent that was predictable and allowed for a presumption of data saturation (Sekaran & Bougie, 2016).

4.2 Measurement Instrument

A self-reported questionnaire that consists of two main sections along with a section regarding control variables was used as the measurement instrument. Control variables considered as categorical measures were composed of gender, age group, educational level, and experience. The two main sections were dealt with a five-point Likert scale (from 1 = strongly disagree to 5 = strongly agree). The first section contained (21) items to measure organizational learning capabilities based on (Alegre & Chiva, 2008; Bess et al., 2011). These questions were distributed into dimensions as follows: five items dedicated for measuring experimentation, four items used for measuring risk taking, four items for measuring interaction with external environment, four items for measuring dialogue, and five items dedicated for measuring participative decision making. Whereas the second section included eight items used to measure service quality according to what was pointed by Aburayya et al. (2020b), Al-Hawary and Al-Menhaly (2016), Al-Hawary and Al-Smeran (2017), Al-Hawary et al. (2011), Al-Khayyal et al. (2020).

5 Findings

5.1 Measurement Model Evaluation

This study was conducted structural equation modeling (SEM) to test hypotheses, which represents a contemporary statistical technique for testing and estimating the relationship between factors and variables (Wang & Rhemtulla, 2021). Accordingly, the reliability and validity of the constructs were tested using confirmatory factor analysis (CFA) through the statistical program AMOSv24. Table 1 summarizes the results of convergent and discriminant validity, as well the indicators of reliability.

Table 1 shows that the standard loading values for the individual items were within the domain (0.637–0.831), these values greater than the minimum retention of the elements based on their standard loads (Al-Lozi et al., 2018; Sung et al., 2019). Average variance extracted (AVE) is a summary indicator of the convergent validity of constructs that must be above 0.50 (Howard, 2018). The results indicate that the AVE values were greater than 0.50 for all constructs, thus the used measurement

Table 1 Results of validity and reliability tests

Constructs	1	2	3	4	5	6
1.EXP	**0.717**					
2.RTA	0.428	**0.739**				
3.IEE	0.406	0.331	**0.737**			
4.DIA	0.527	0.468	0.442	**0.759**		
5.PDM	0.397	0.528	0.439	0.578	**0.731**	
6.SEQ	0.681	0.609	0.655	0.661	0.624	**0.728**
VIF	1.894	2.667	1.530	2.472	3.015	–
Loadings range	0.682–0.761	0.671–0.791	0.642–0.803	0.724–0.792	0.637–0.822	0.644–0.831
AVE	0.514	0.547	0.542	0.576	0.535	0.530
MSV	0.483	0.328	0.439	0.451	0.397	0.499
Internal consistency	0.835	0.826	0.822	0.841	0.847	0.881
Composite reliability	0.840	0.828	0.825	0.845	0.851	0.900

Note EXP: experimentation, RTA: risk taking, IEE: interaction with external environment, DIA: dialogue, PDM: participative decision making, SEQ: service quality, Bold fonts express to square root of AVE

model has an appropriate convergent validity. Rimkeviciene et al. (2017) suggested the comparison approach as a way to deal with discriminant validity assessment in covariance-based SEM. This approachis based on comparing the values of maximum shared variance (MSV) with the values of AVE, as well as comparing the values of square root of AVE ($\sqrt{}$AVE) with the correlation between the rest of the structures. The results show that the values of MSV were smaller than the values of AVE, and that the values of $\sqrt{}$AVE were higher than the correlation values among the rest of the constructs. Therefore, the measurement model used is characterized by discriminative validity. The internal consistency measured through Cronbach's Alpha coefficient (α) and compound reliability by McDonald's Omega coefficient (ω) was conducted as indicators to evaluate measurement model. The results listed in Table 1 demonstrated that both values of Cronbach's Alpha coefficient and McDonald's Omega coefficient were greater than 0.70, which is the lowest limit for judging on measurement reliability (De Leeuw et al., 2019).

5.2 Structural Model

The structural model illustrated no multicollinearity issue among predictor constructs because variance inflation factor (VIF) values are below the threshold of 5, as shown

in Table 1 (Hair et al., 2017).This result is supported by the values of model fit indices shown in Figs. 1 and 2.

The results in Fig. 1 indicated that the chi-square to degrees of freedom (CMIN/DF) was 2.173, which is less than 3 the upper limit of this indicator. The values of the goodness of fit index (GFI), the comparative fit index (CFI), and the Tucker-Lewis index (TLI) were upper than the minimum accepted threshold of 0.90. Moreover, the result of root mean square error of approximation (RMSEA) indicated to value 0.068, this value is a reasonable error of approximation because it is less than the higher limit of 0.08. Consequently, the structural model used in this study was recognized as a fit model for predicting the DEP and generalization of its result (Ahmad et al., 2016; Shi et al., 2019). To verify the results of testing the study hypotheses, structural equation modeling (SEM) was used, the results of which are listed in Table 2.

The results demonstrated in Table 2 show that interaction with external environment has the highest positive impact relationship on service quality($\beta = 0.708$, $t = 29.10$, $p = 0.000$), followed by experimentation ($\beta = 0.672$, $t = 27.20$, $p = 0.000$), then dialogue($\beta = 0.614$, $t = 23.48$, $p = 0.003$),then participative decision making($\beta = 0.562$, $t = 20.81$, $p = 0.005$), and finally the lowest impact was for risk taking(β

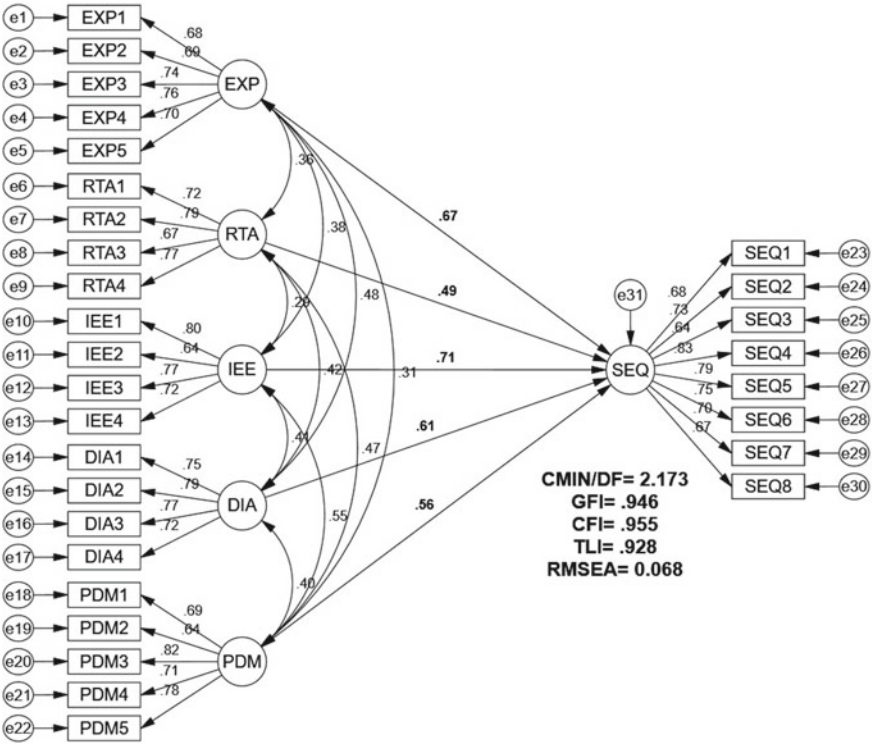

Fig. 2 SEM results of the organizational learning capabilities effect on service quality

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Table 2 Hypothesis testing

Hypothesis	Relation	Standard beta	*t* value	*p* value
H1	EXP → SEQ	0.672	27.20***	0.000
H2	RTA → SEQ	0.493	18.45*	0.02
H3	IEE → SEQ	0.708	29.10***	0.000
H4	DIA → SEQ	0.614	23.48**	0.003
H5	PDM → SEQ	0.562	20.81**	0.005

Note EXP: experimentation, RTA: risk taking, IEE: interaction with external environment, DIA: dialogue, PDM: participative decision making, SEQ: service Quality, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

$= 0.493$, $t = 18.45$, $p = 0.02$). Thus, all the study hypotheses were supported based on these results.

6 Discussions and Recommendations

Study results showed that there is a significant impact of organizational learning capabilities (experimentation, risk taking, interaction with the external environment, dialogue, and participation in decision-making) on the service quality of Islamic banks operating in Jordan. this result is rational, as skills, knowledge and human resources optimal availability and the existence of learning work environment enables company to create and integrate ideas effectively and communicate with various organizational boundaries to improve knowledge sharing through communication and interaction and create an appropriate environment through which human efforts gather in order to create creative ways contribute in improving service quality level. This result agree with Darwaza et al. who concluded that there is an impact of organizational learning on the elements of quality culture, this also agree with Ajilat, who assured the impact of learning orientation on technical creativity, as well as the study of Mat and Razak (2011), which found a relationship between organizational learning capabilities dimensions (participation in decision-making, Experimentation, interaction with the external environment and risk) on the technological product innovation successful implementation.

Upon study findings, the researcher recommends managers and decision makers to invest the human element continuously by involving them in the decision-making process to acquire administrative skills along with technical skills they already have. It's better for organizations to work on consolidating the relationship with the external environment to facilitate linking it with the internal environment and to provide a greater opportunity for workers to learn from competitors' experiences, and learn more about the latest developments in their sector technology. In addition meeting employees annually to open dialogue and discussion with them, listening to them, and arguing them to reach executive solutions that suit both parties

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Impact of Knowledge Management on Administrative Innovation of Software Companies in Jordan

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Abstract The major aim of the study was to examine the impact of knowledge management on administrative innovation. A qualitative method based on a questionnaire was used in this study for data collection and sample selection. Therefore, it focused on of Software Companies in Jordan. Data were primarily gathered through self-reported questionnaires creating by Google Forms which were distributed to a

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_92

purposive sample of managers via email. Statistical program AMOSv24 was used to test the study hypotheses. The study results show that the highest impact on administrative innovation was for knowledge generation, followed by knowledge applying, then knowledge storing, and finally the lowest impact was for knowledge dissemination. Researchers recommend decision-makers to pay attention to the tacit knowledge and experiences of employees, and turn them into tangible ideas and methods that contribute to the development of work performance, and to refine the personalities of their employees by supporting their ideas and suggestions and activating their role in solving problems.

Keywords Knowledge management · Administrative innovation · Software companies · Jordan

1 Introduction

There have become challenges facing organizations in general worldwide; Because of the developments and changes that occur rapidly, organizations must keep pace with these developments and work to find the best ways to ensure their survival, and their continuity to achieve goals such as increasing profits, which led to the organizations' interest in managing the knowledge represented by the tacit and explicit knowledge that individuals have to take advantage of that knowledge, and employ it to achieve administrative creativity (Al-Hawary, 2015; Al-Hawary & Al-Hamwan, 2017; Al Mehrez et al., 2020).

The current era is described as the era of knowledge, as knowledge is the real capital that outweighs in its importance and values other natural resources (Al-Maroof et al., 2021; Al Mehrez et al., 2020). This era is also characterized by intense interest in the human resource and his development and investment of his mental abilities, and considering it the basis for achieving any progress in the effectiveness of the organization, as well as interest in the integration of the knowledge sources, organizing and development (Al-Hawary & Al-Namlan, 2018; Al-Lozi et al., 2017; Al-Nady et al., 2013; Metabis & Al-Hawary, 2013). Knowledge has become the highest percentage in the composition of the gross national product of the economically, technically and cognitively advanced countries, and for the importance of knowledge in building and developing individuals, groups, organizations and countries (Al-Hawary et al., 2016). The managements have interested in building programs for the development and employment of knowledge to achieve continuous improvement in the main and supportive operations and activities of the organization. The management also pointed out the importance of distinguishing between the latent or self-knowledge of the individual and the external knowledge that comes to him from environmental sources, and the need to mix them, as one is indispensable to the other (Al-Hawary & Alwan, 2016).

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The need to pay attention to the human element and work to invest in it positively began, as human societies do not advance or develop, without the presence of creators and innovators in various fields who are considered basic pillars in the structure of the human society as they work to produce, and develop, they represent the hope of solving problems that hinder civilized and human progress (Alhalalmeh et al., 2020; Al-Hawajreh et al., 2011; Al-Hawary et al., 2012, 2020; Mohammad et al., 2020). Creativity in all fields has become an urgent and essential necessity, so that society, including individuals and institutions, is able to keep pace with the times, which is characterized by the nature of technical progress, knowledge explosion, the abundance of inventions and the multiplicity of cultures, each of them is trying to impose itself on the other in the era of globalization. Today, we live in a world characterized by complexity and problems that explode day after day, so that creativity and innovation are the solution that makes the individual and society able to keep pace with the requirements of this era (Ghannajeh et al., 2015; Al-Hawary & Aldaihani, 2016; Almaazmi et al., 2020).

Many researchers have revealed that humans invent, create and innovate, since the inception of creation until now. Most human civilizations, throughout the ages and time, have cared for their children and worked to develop them and increase mental abilities in all fields (Al-Hawary & Al-Rasheedy, 2021; Al-Lozi et al, 2017). Creativity is important in the modern era because it is the real bridge on which the theoretical ideas of peoples and individuals cross to the righteousness of practical creative works, in addition to that creativity is an effective and practical test for measuring excellence because it is easy to see and evaluate the works of creators accurately. (Al-Hawary & Alwan, 2016).

2 Theoretical Framework and Hypotheses Development

2.1 Knowledge Management

Knowledge is one of the most important resources of the most interest in business organizations, and the most important fact is that development and progress in advanced economic societies has become dependent on knowledge and intellectual capital (Al-Hawary & AL-Zeaud, 2010; Al-Hawary, 2009; Al-Hawary & Shdefat, 2016; Al-Hawary & Nusair, 2017), and the exploitation of intellectual assets as is the case in other assets and with the same degree of importance, but rather in some sectors that depend heavily Directly on the intellectual assets in the nature of its business. The abilities, experiences and skills of humans are not equal among them, there is a group of them that possess the mentioned components more than others (Allahow et al., 2018; AlHamad et al., 2022; Alshurideh et al., 2022).

Knowledge has become one of the critical driving forces for business success regardless of the nature of its work, whether commercial, industrial or service, organizations have become more knowledge-intensive, and the belief of most managers

to achieve their strategic goals has become the extent of their possession of knowledge (Aldaihani & Ali, 2018, 2019; Alshura et al., 2016), so they relied on minds more than hands and the need to benefit increases of the value of knowledge, and as a result knowledge has been treated systematically and considered as an important resource like capital and other tangible resources (Al-Hawary & Metabis, 2012).

Many organizations are exploring the field of knowledge management in order to improve their competitiveness, and sustainability, which increases company returns, employee satisfaction and loyalty, and improves the competitive position by focusing on intangible assets (Al-Hawary & Hadad, 2016; Al-Hawary & Ismael, 2010), which necessitates the need for a more systematic and in-depth study concerning the critical success factors for the implementation of knowledge management is critical, organizations must be aware of the factors that will affect the success of the knowledge management practice.

Knowledge is one of the old renewable terms, and interest in it has been since ancient times, and in the present time, organizations have come to view knowledge as an effective basis for achieving competitive advantage and creativity, as it has become the competitive tool for many organizations in various sectors, so knowledge is one of the most important factors that organizations need. To achieve success, and keep pace with the changes that the world is witnessing from a technological revolution as a result of the development in the field of technology and communications and its use in the field of obtaining knowledge and sending information (Al-Hawary & Aldaihani, 2016).

Knowledge is the key to outstanding competitiveness, better customer service, and faster access to markets, performance development, innovation and creativity (Allahow et al., 2018; Alshurideh, 2019; Alshurideh et al., 2020). This necessitated the need to organize and manage that process to take advantage of it to reach the goals and help these organizations in making the appropriate decision. Knowledge management has become one of the solutions used in organizations to face the risks and challenges that these organizations may be exposed to, and therefore the knowledge balance of those organizations must be invested (Al-Hawary & AL-Zeaud, 2010; Shannak et al., 2012; Al-Hawary & Nusair, 2017). The use of ICT is one of the important factors that helped and stimulated knowledge management. The challenge is no longer limited to finding information for the organization, but rather how to search for it through the information available in the organization to employ it and enhance its competitive position (Allahow et al., 2018). In the following, we will mention some of the definitions of knowledge management (see Table 1).

Through the previous definitions, knowledge management can be defined as a set of operations and activities by the management of the organization aimed at identifying and finding the required knowledge and following different administrative methods in order to help in investing it well to achieve a competitive advantage that is unique from other organizations and gives it an opportunity for survival, continuity and development. Knowledge is the set of processes and activities that begin with the dissemination of knowledge among individuals and groups in the organization to achieve the goals of raising the level of performance, making decisions, solving problems and survival. Researchers noted that knowledge management measures varied,

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Table 1 Definitions of knowledge management

Author	Definitions
Girard and Girard (2015)	The processes of creating, sharing, using and managing information and knowledge in an organization
Wiig (2013)	A set of clear and well-defined approaches and processes aimed at discovering Knowledge, both positive and negative, of various types of operations, managing them, defining new products or strategies, enhancing human resource management, and achieving a number of other objectives
Laudon and Laudon (2007)	That process that provides knowledge to workers in various sectors by providing information and disseminating knowledge and information

Table 2 Knowledge management measures in previous studies

Author	Dimensions
Parisa (2015)	Knowledge production, knowledge sharing, knowledge development and continuous improvement
Bognar and Bansal	Knowledge generation, knowledge building, knowledge efficiency
William et al. (2008)	Knowledge generation, knowledge acquisition and sharing Knowledge, knowledge transfer
Nasiruzzaman and Dahlan (2013)	Explicit knowledge and tacit knowledge

due to the different methods and visions of researchers about knowledge management and its objectives. Table 2 is illustrated knowledge management measures as mentioned by researchers:

Knowledge acquisition: The process of obtaining knowledge is the first stage of learning at the individual and collective level in the organization and it is the cornerstone of this process (Marquardt, 1996). Knowledge is gained and obtained through internal and external sources. Examples of external sources are: marketing intelligence, industry and academic research, as well as from mergers and acquisitions and through the recruitment of new employees. As for the internal sources of knowledge, they are represented by dialogue sessions and communication between group members, in addition to the availability of basic data such as the financial and economic data of the company.

Knowledge Sharing: Sinkula emphasized that communication between the departments of the organization is necessary and is one of the most important dimensions of organizational learning (Sinkula, 1994; Argyris & Schön, 1996; Teo et al., 2006). Whereas, the communication between the departments will lead to the dissemination of knowledge among them, and makes the knowledge available throughout the organization. Workers share it, which leads to an increase in their experiences, and the transfer of tacit knowledge inside their minds to their colleagues. This was confirmed

by Herschel, who said that the process of transferring productive knowledge requires transforming it from tacit knowledge to explicit knowledge (Herschel, 2000). Heisig and Rorbeek (2000) indicated that there are several methods for distributing and disseminating knowledge such as internal information networks (intranets), training by old colleagues, experience teams, learning circles, and knowledge circles. These methods provide knowledge throughout the organization, which helps to increase effectiveness, access to new technology, and identify the factors in the organization's surrounding environment, and over time it becomes a culture in the organization (Teo et al., 2006).

Knowledge Implementation: At this stage, the greatest benefit is evident from all previous stages, as knowledge moves into application and benefit from what has been learned to reflect on the performance of the organization, and allow its employees to solve the problems they face through the knowledge that has been acquired, and thus becomes the knowledge acquired and spread in all parts of the organization have meaning and value. The use of knowledge spread in the organization in all its forms of documents, procedures and databases leads to an increase in the experience and capabilities of employees. This helps the organization to innovate, which will eventually lead to the continuation of the organization and increase its competitiveness.

Knowledge storage: The acquired knowledge is stored in repositories and knowledge stores within the organization, and the aim is to preserve the acquired knowledge so that all members of the organization can access and benefit from it, especially the knowledge that was used as a way to solve previous problems, to try to solve the current problems in the same way or avoid the failed attempts that were previously used to solve it. Knowledge can be stored in several ways, including organizational memory, which contains existing knowledge in its various forms, including written documents, and information stored in electronic databases. Human knowledge is stored in expert systems as well as tacit knowledge gained by individuals and business networks. Knowledge repositories constitute an essential technology in knowledge-based learning organizations, as they are keen to manage their knowledge content to meet the opportunities of future changes using the necessary supporting technology.

2.2 Administration Innovation

Today, the world is witnessing a lot of changes and developments in various fields of economic, social, cultural, political, technical, and information life, which prompted organizations, whether public or private, to seek to develop internal working methods, on a permanent and continuous basis, so that these organizations can keep pace with the tremendous knowledge developments that occur in today's world, and achieve this by investing the energies of innovators within them to the fullest extent, and benefiting from them so that these innovators can perform the roles entrusted to them to the fullest (Al Suwaidi et al., 2020; Al-Hawary & Aldaihani, 2016).

Administrative innovation is an important basic means for the growth and development of organizations, for their sustainability on the one hand, and in order to achieve the desired goals on the other hand, as an organization that does not innovate or develop is destined to decline and decay, but may be demise. Administrative innovation helps organizations adapt to various changes, and helps them to face challenges, whether political, economic, technical or informational, and thus achieve the goals of the organization that it seeks to achieve, and creativity leads to renewal and innovation, which makes the organization ahead of other competing organizations, it guarantees them access to advanced positions in the competition (Allahow et al., 2018; Alameeri et al., 2021; Alzoubi et al., 2022). Because of the importance that innovation achieves, it is necessary to provide the appropriate atmosphere for work in addition to allocating the necessary means for developing innovation by following stages and strategies that enable the organization to reach the highest levels of administrative creativity, which leads to an increase in the efficiency of the human element as the main factor for increasing productivity within organizations (Altamony et al., 2012; Alameeri et al., 2020; Al-Hawary & Al-Rasheedy, 2021).

Administrative innovation is divided into incremental innovation and radical innovation based on the size of the change it causes. Radical innovation the amount of change is large, in other words, "innovation can be embodied in a new technology that leads to changing the current structure of the market" (Claver et al., 1998; Alyammahi et al., 2020) and contains new products and services that did not exist previously. Incremental innovation includes gradual change, is not significant, such as developing the current incentive system and not completely abandoning it. There are clear differences between the two types. Incremental innovation is related to exploitative learning, which is the acquisition of new behavioral capabilities, but within the same current visions of the organization. On the other hand, radical innovation is related to exploratory learning, which occurs when the organization acquires new behavioral capabilities that lead to changing the current visions of the organization and forming new ones (March, 1991; AlShehhi et al., 2020; Agha et al., 2021; Batayneh et al., 2021; Kurdi et al., 2020; Nuseir et al., 2021).

It is not permissible to talk about administrative innovation without the availability of its basic elements and components, as the importance of the elements and components of innovation is to define and measure it at the level of the group, the individual and the organization. Accordingly, management scholars and researchers unanimously agreed on the existence of the following elements of innovation:

Originality: This is intended to be renewal or singling out with ideas. The innovator person has an original thinking, that is, he moves away from the ordinary or the common. He does not repeat the ideas of others. It also refers to the ability of the innovator to produce original ideas with few repetitions within the group to which he belongs and the criterion for judging the idea as original. It is not subject to circulated ideas and out of the ordinary (Al-Hawary & Al-Rasheedy, 2021).

Fluency: It is intended to produce the largest number of synonyms, ideas or uses when responding to a specific stimulus, and the speed in generating them, and it also means the ability to recall the largest possible number of ideas for a particular

situation within a relatively short period of time, and also means the multiplicity of ideas that can come with it. The innovator individual, characterized by its suitability to the requirements of the real environment (Al-Hawary & Alwan, 2016).

Flexibility: It means the diversity of ideas that the innovator individual brings, and his ability to change or transform his thinking or his point of view according to the requirements of the situation. The degree of ease with which the innovator changes a certain position or mental point of view, and it also means looking at things from several angles (Al-Hawary & Al-Rasheedy, 2021).

Dealing with risks: It means how brave the innovator individual is in exposing himself to failure or criticism, making a lot of guesses, working under ambiguous circumstances, and defending his own ideas. It also means taking the initiative to adopt new ideas and methods and studying for solutions and at the same time being the individual is capable of bearing the risks resulting from the work he undertakes, and he is ready to face the responsibilities.

Sensitivity to problems: the ability to sense problems and realize their nature and identify them and the innovator person notices that there is something wrong that others do not notice (Allahow et al., 2018).

2.3 Knowledge Management and Administrative Innovation

Knowledge is the key to outstanding competitiveness, better customer service, faster access to markets, performance development, innovation and creativity (Al-Hawary & Alwan, 2016; Alshurideh, 2022). The use of knowledge spread in the organization in all its forms of documents, procedures and databases leads to an increase in the experience and capabilities of employees, which helps the organization to innovate, which will eventually lead to the continuation of the organization and increase its competitiveness. Hajir notes that there is a significant positive impact of knowledge management infrastructure on innovation. The results strongly increase from previous studies, which reveal that the dimension of knowledge management infrastructure has the greatest impact on innovation. The results of the current study have several managerial implications for organizations. If mobile telecommunications companies in Jordan wish to enhance their innovation capabilities, they must work to maintain an effective knowledge management infrastructure that invests mainly in information technology. Ling also showed that the effectiveness of knowledge acquisition has a significant impact on managerial innovation. Accordingly, the study hypothesis can be formulated as follows:

There is a statistically significant effect of knowledge management on administrative innovation.

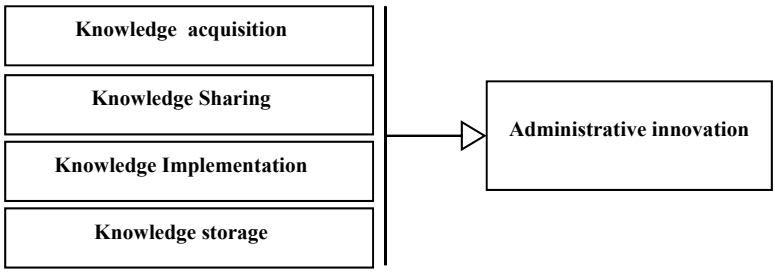

Fig. 1 Theoretical model

3 Research Model

See Fig. 1.

4 Methodology

4.1 Population and Sample Selection

A qualitative method based on a questionnaire was used in this study for data collection and sample selection. The major aim of the study was to examine the impact of knowledge management on administrative innovation. Therefore, it focused on of Software Companies in Jordan. Data were primarily gathered through self-reported questionnaires creating by Google Forms which were distributed to a purposive sample of managers via email. In total, (148) responses were received including (13) invalid to statistical analysis due to uncompleted or inaccurate. Hence, the final sample contained (135) responses suitable to analysis requirements, where it proved to be sufficient to the extent that was predictable and allowed for a presumption of data saturation (Sekaran & Bougie, 2016).

4.2 Measurement Instrument

A self-reported questionnaire that consists of two main sections along with a section regarding control variables was used as the measurement instrument. Control variables considered as categorical measures were composed of gender, age group, educational level, and experience. The two main sections were dealt with a five-point Likert scale (from 1 = strongly disagree to 5 = strongly agree). The first section contained (20) items to measure knowledge management based on (Al-Hawary & Aldaihani, 2016). These items were distributed into dimensions as follows: fiveitems

dedicated for measuring knowledge generation (KG1-KG5), fiveitems dedicated for measuring knowledge storing (KS1-KS5), five items dedicated for measuring knowledge dissemination (KD1-KD5), and five items dedicated for measuring knowledge applying (KA1-KA5). Whereas the second section included seven items developed to measure administrative innovation (AI1-AI7) according to what was pointed by Al-Hawary and Alwan (2016).

5 Findings

5.1 Measurement Model Evaluation

This study was conducted structural equation modeling (SEM) to test hypotheses, which represents a contemporary statistical technique for testing and estimating the relationship between factors and variables (Wang & Rhemtulla, 2021). Accordingly, the reliability and validity of the constructs were tested using confirmatory factor analysis (CFA) through the statistical program AMOSv24. Table 3 summarizes the results of convergent and discriminant validity, as well the indicators of reliability.

Table 3 shows that the standard loading values for the individual items were within the domain (0.657–0.857), these values greater than the minimum retention of the elements based on their standard loads (Al-Lozi et al., 2018; Sung et al., 2019). Average variance extracted (AVE) is a summary indicator of the convergent validity of constructs that must be above 0.50 (Howard, 2018). The results indicate that the AVE values were greater than 0.50 for all constructs, thus the used measurement model has an appropriate convergent validity. Rimkeviciene et al. (2017) suggested

Table 3 Results of validity and reliability tests

Constructs	KG	KS	KD	KA	AI
KG	**0.791**				
KS	0.517	**0.760**			
KD	0.467	0.614	**0.773**		
KA	0.539	0.468	0.544	**0.769**	
AI	0.715	0.705	0.721	0.734	**0.760**
VIF	1.674	2.197	2.371	1.937	–
Loadings range	0.668–0.857	0.681–0.824	0.657–0.843	0.693–0.827	0.673–0.817
AVE	0.625	0.577	0.597	0.591	0.578
MSV	0.514	0.497	0.502	0.535	0.473
Internal consistency	0.890	0.869	0.876	0.873	0.901
Composite reliability	0.892	0.872	0.880	0.878	0.905

Note KG: knowledge generation, KS: knowledge storing, KD: knowledge dissemination, KA: knowledge applying, AI: administrative innovation, Bold fonts indicate to square root of AVE

the comparison approach as a way to deal with discriminant validity assessment in covariance-based SEM. This approachis based on comparing the values of maximum shared variance (MSV) with the values of AVE, as well as comparing the values of square root of AVE ($\sqrt{}$AVE) with the correlation between the rest of the structures. The results show that the values of MSV were smaller than the values of AVE, and that the values of $\sqrt{}$AVE were higher than the correlation values among the rest of the constructs. Therefore, the measurement model used is characterized by discriminative validity. The internal consistency measured through Cronbach's Alpha coefficient (α) and compound reliability by McDonald's Omega coefficient (ω) was conducted as indicators to evaluate measurement model. The results listed in Table 3 demonstrated that both values of Cronbach's Alpha coefficient and McDonald's Omega coefficient were greater than 0.70, which is the lowest limit for judging on measurement reliability (De Leeuw et al., 2019).

5.2 Structural Model

The structural model illustrated no multicollinearity issue among predictor constructs because variance inflation factor (VIF) values are below the threshold of 5, as shown in Table 3 (Hair et al., 2017). This result is supported by the values of model fit indices shown in Fig. 2.

The results in Fig. 2 indicated that the chi-square to degrees of freedom (CMIN/DF) was 2.468, which is less than 3 the upper limit of this indicator. The values of the goodness of fit index (GFI), the comparative fit index (CFI), and the Tucker-Lewis index (TLI) were upper than the minimum accepted threshold of 0.90. Moreover, the result of root mean square error of approximation (RMSEA) indicated to value 0.038, this value is a reasonable error of approximation because it is less than the higher limit of 0.08. Consequently, the structural model used in this study was recognized as a fit model for predicting the DEP and generalization of its result (Ahmad et al., 2016; Shi et al., 2019). To verify the results of testing the study hypotheses, structural equation modeling (SEM) was used, the results of which are listed in Table 4.

The results demonstrated in Table 4 show that the highest impact on administrative innovation was for knowledge generation ($\beta = 0.579, t = 24.21, p = 0.000$), followed by knowledge applying ($\beta = 0.521$, $t = 22.96$, $p = 0.000$), then knowledge storing ($\beta = 0.462$, $t = 19.88$, $p = 0.003$), and finally the lowest impact was for knowledge dissemination ($\beta = 0.388$, $t = 17.38$, $p = 0.008$). Thus, all the research hypotheses were supported based on these results.

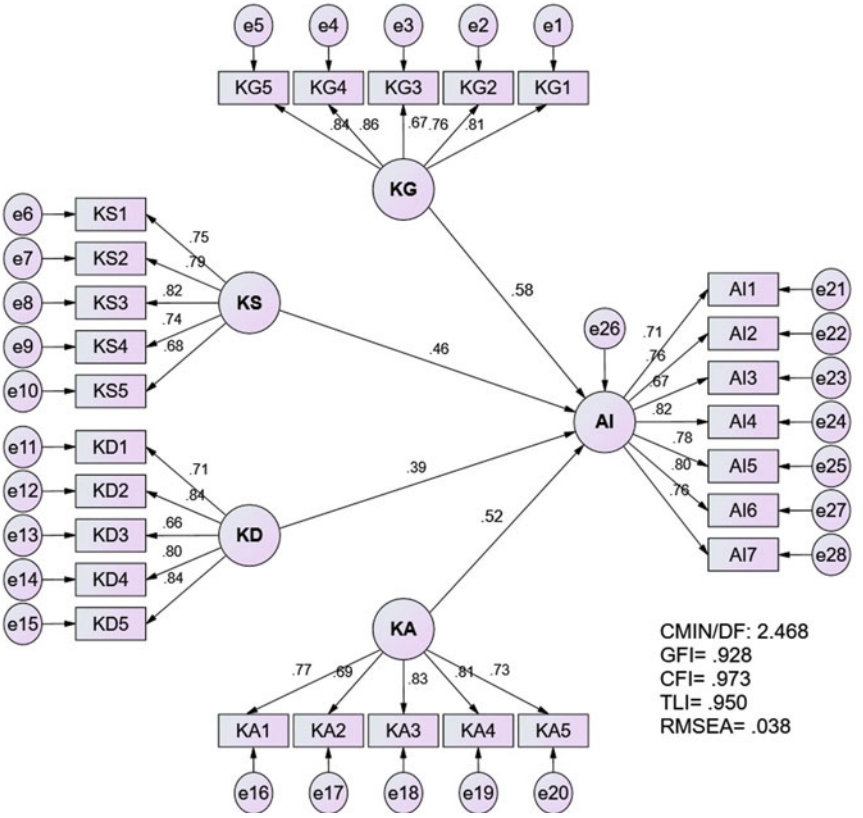

Fig. 2 SEM results of the knowledge management effect on administrative innovation

Table 4 Hypothesis testing

Hypothesis	Relation	Standard beta	*t* value	*p* value
H1	KG → AI	0.579	24.21***	0.000
H2	KS → AI	0.462	19.88**	0.003
H3	KD → AI	0.388	17.38**	0.008
H4	KA → AI	0.521	22.96***	0.000

Note KG: knowledge generation, KS: knowledge storing, KD: knowledge dissemination, KA: knowledge applying, AI: administrative innovation, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

6 Conclusion

The study results showed that the study population adopts strategies that contribute to achieving the maximum benefit from all intellectual and information resources through the collection and sharing of ideas and information among all work-related

parties, including employees, administrators and various business partners, on the other hand, providing all the needs of technology and equipment that enable workers to increasing their stock of various information and knowledge that helps them to develop their skills and abilities to accomplish various work tasks and duties, and provides them with a flexible environment that enables them to unleash their creative ideas which contribute to inventing advanced ways and methods of work, and motivates them to participate in developing solutions to the problems that hinder the performance of work as required, and provides their employees with tools and equipment that help them to retain all information and data related to work, and enables them to refer to it when needed, and motivates them to share ideas and information, and provides them with modern communication channels to receive and send all work-related activities between them. It also gives workers complete freedom in how to perform their work, which enables them to take the approach and method as required by the current stage of work in accordance with its policies in performing work activities, which leads to their possession of capabilities and skills that enable them to analyze problems which affect work, and what are the appropriate solutions to them.

7 Discussion

The results of the study showed that there is an impact of knowledge management on administrative innovation, the researchers attribute this result to the importance of the role played by knowledge management by putting forward ideas and methods that enable employees to accomplish their work in innovative and modern ways which affect the work better, on the other hand, increasing the ability of management to discover all the talents and skills of employees. In addition, the workers possess the skills, expertise and experience related to work by creating information that enables them to devise advanced methods and methods to perform work activities and tasks, and provide a system of incentives for each individual who presents ideas and suggestions that will contribute to the development and prosperity of work, and their keenness to provide tools which enables them to keep all suggestions and constructive ideas that serve the objectives and policies of the work in an appropriate manner, and which enables all employees to easily and quickly refer to them when needed through the use of an advanced system of information systems and databases. Also, providing all the means and capabilities that help them implement their ideas and knowledge, and supervise them by specialists to ensure that they are applied in the correct and appropriate manner. On the other hand, workers are provided with the ability to study and analyze the implementation mechanisms, requirements and expected obstacles, enabling them to apply their knowledge without falling into problems or errors.

8 Recommendations

Researchers recommend decision-makers to pay attention to the tacit knowledge and experiences of employees and turn them into tangible ideas and methods that contribute to the development of work performance, and to refine the personalities of their employees by supporting their ideas and suggestions and activating their role in solving problems, which makes them able to be creative and innovative in accomplishing work tasks. In addition to keeping pace with technological developments by providing modern equipment that enables them to create ideas and information, preserve and distribute them in ways that enable employees to make optimal use of knowledge, and pay attention to supporting the positive qualities of workers and administrators represented in their feeling that they are rewarded for their work, and play a major role in solving problems and maintaining the survival of and business boom. And finally, attention to individuals with outstanding creative abilities, providing them with the appropriate atmosphere and conditions, and motivating them through an appropriate reward system.

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The Impact of Intellectual Capital on Competitive Capabilities: Evidence from Firms Listed in ASE

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Abstract This study aims at examining the impact of intellectual capital on achieving competitive capabilities. A qualitative method based on a questionnaire was used in this study for data collection and sample selection. Data were primarily gathered through self-reported questionnaires creating by Google Forms which were

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_93

distributed to a purposive sample of senior managers via email. Structural equation modeling (SEM) was used to test hypotheses. The study results showed that the highest impact on competitive capabilities was for structural capital, followed by intellectual capital, and finally the lowest impact was for human capital. In light of the findings of the study, researchers recommend paying attention to intellectual capital by paying attention to scientific competencies and preserving them by all means, providing the appropriate atmosphere to support talents and providing opportunities for ideas that are put forward by workers and put into practice.

Keywords Intellectual · Capital · Competitive capabilities · Firm · ASE

1 Introduction

The importance of information escalated with the emergence of the technology and computer revolution, so that information and knowledge became a source and basis for information technology, and the importance of knowledge based in the minds of individuals, focusing on individuals' skills and abilities to innovate and creativity (Allahow et al., 2018; Mohammad, 2020; Al-Hawary & Obiadat, 2021; Al-Hawary & AlDafiri, 2017; Bebba et al., 2017), generated the concept of intellectual capital (Al-Hawary et al., 2020; Alshura et al., 2016; Metabis & Al-Hawary, 2013; Mohammad et al., 2020). And it enjoys great and growing interest from the managers and leaders in organizations that seek to develop and succeed in an era which has become characterized by speed, technological development and intense competition between business organizations (Al-Hawary & Al-Syasneh, 2020; Al-Lozi et al., 2018; Al-Nady et al., 2016). Thus, the organizations looked at the concept of intellectual capital after the physical capital was dominant and whoever owns it owns the organization. The one who owns the knowledge becomes the one who owns the organization, and the organizations are now more accommodating of knowledge and more using it in an attempt to achieve their goals, satisfy customers and distinguish between their competitors (Al-Hawary & Nusair, 2017; Al-Hawary & Shdefat, 2016).

It has become necessary for organizations to work on evaluating their intellectual capital, and to work on developing it and transforming it into gains and a competitive advantage that distinguishes it from others, he higher the value of human resources, the greater the value of the organization (Al-Lozi et al., 2017; Al-Hawary et al., 2011; Mohammad et al., 2020; Al-Hawary, 2015; Alhalalmeh et al., 2020; Al-Hawary, 2013). Human capital has become the real capital and is responsible for the process of renewal and innovation in the organization, and since the current era is characterized by openness, rapid development and globalization, business organizations, if they want to live in this environment, must possess the strength that enables them to grow, continue and survive, this strength is represented by intellectual capital (Al-Hawary & Al-Syasneh, 2020; Al-Hawary & Alajmi, 2017; Al-Hawajreh et al., 2011; Al-Hawary & Al-Namlan, 2018; Al-Hawary et al., 2013a, 2013b). Therefore, the organization must realize the importance of intellectual capital and try to realize it

and work with it in order to achieve its goals and mission, and therefore it needs workers who have knowledge and are good and always strive to provide what is best, and seek to find an internal organizing to perform work flexibly and effectively, which must be built a distinguished intellectual capital that serves it in achieving its strategy and guarantees it continuity in the work performance of its work (Al- Quran et al., 2020; Al-Hawary & Al-Kumait, 2017; Al-Hawary et al., 2011). Contemporary organizations live in a highly competitive environment, an environment characterized by speed and technological change, and these organizations are trying to catch up with technology and competition between companies and try to gain an advantage over other organizations (Al-Hawary & Batayneh, 2015). Leaders, management and workers in these organizations are accused of neglecting the issue of intellectual capital and not delving into it and realizing its importance despite its role in making them strong competitive organizations in the era of speed and technological change, which is the force that enables them to achieve what they aspire to. This study seeks to identify the impact of intellectual capital on competitive capabilities.

2 Theoretical Framework and Hypotheses Development

2.1 Intellectual Capital

With the emergence of globalization and the increasing importance of information and knowledge, and in light of the challenges and economic changes, organizations' interest in intellectual capital increased, and these organizations realized that the human element is the most important type of investment and that all its physical assets are useless if there is no human element that has the capabilities, abilities, and the necessary advanced and renewable knowledge to manage these assets (Al-Hawary & Ismael, 2010; Al-Hawary & Metabis, 2012). Thus, the focus of organizations shifted to intangible assets and considered them a source of wealth. Intellectual capital became the indicator of the organization's possession of a competitive advantage, but its value depends on the extent of interest in it, its development and its effective management (Al-Hawary & Haddad, 2016; Al-Hawary & Al-Hamwan, 2017).

Ungerer (2004) stated that researchers, analysts, and managers became increasingly interested in intellectual capital in the 1980s when intangible assets often emerged as a major determinant of company profits. Since the concept of intellectual capital appeared and its importance increased, many definitions of it have been put forward (Al-Hawary & Hadad, 2016).

Fen et al. (2012) argues that intellectual capital is only evidence that an organization is operating effectively or not. Auer described it as: "The difference between the market and the book value of the company, and there is no doubt that the intellectual capital represents the most important stock of knowledge on an organized basis, this value is usually not announced in the annual reports and does not appear in the analysis of traditional models." Bounfour and Edvinsson (2005) see it as a process of

integrating human capital with strategic structural capital to obtain additional results for the future performance of employees. Rehman et al. (2011) see that human capital is the skill and experience of employees that increase with training and the higher the efficiency of the employees, the higher the efficiency of the organization. Leaniz and Bpsque (2013: 266) defined it as "knowledge that can be turned into profits in the future comprising resources such as ideas, inventions, technologies, designs, processes, and information programmes".

The subject of measurement is one of the most important topics that take into account when mentioning intellectual capital. Its importance stems from the importance of the subject it measures. Villanueva states that valuation of intangible assets is an important process for evaluating the quality of performance. Abdel Moneim believes that modern methods of measuring intellectual capital depend on the present and the future in measuring the value of the company and focus on quality, while traditional accounting methods focus on the past in the measurement process and on the results of previous transactions. There is a great difference between researchers about the ways in which intellectual capital is measured, and the reason for this difference is due to the intangible nature of intellectual capital and therefore difficult to measure and identify.

Stewart Model is the most common model in measuring intellectual capital. Stewart (1997) classifies intellectual capital into human capital which represents the knowledge, experience and skills possessed by workers, the ability to be creative and everything that distinguishes workers in the organization from others. Structural capital represents systems, procedures, culture, patents, copyrights, and anything that remains in the organization when employees leave. And relational capital represents the rate of loyalty and relationships with allies and suppliers.

Human capital: Human capital is the most important component of intellectual capital. Whatever the organization possesses of material assets, it still needs human minds to manage these assets, benefit from and maximize them (Alkalha et al., 2012; AlHamad et al., 2022; Alshurideh et al., 2022). Hence the importance of human capital stems from the knowledge that workers possess of skills, experiences, and the ability to innovate and deal with problems, looking to the future and predicting it, the value of this knowledge increases with development and training (Al Kurdi et al., 2021; Shamout et al., 2022a, 2022b). Banany believes that it is one of the most important production tools that contribute to raising the level of quality of services provided to customers and thus lead to a competitive advantage in the market, which increases the value of the company. As for Joia (2007), he saw it as abilities, skills, knowledge, and ability to solve problems, ability to be creative, work with the group, ability to learn, influence others, and ability to adapt to changing circumstances.

Structural capital: Everything that remains in the organization after the employees leave it and forms the infrastructure of the organization such as policies, procedures, databases, equipment, buildings, trademarks and copyrights (Alshurideh et al., 2015; Alameeri et al., 2020; Al Kurdi et al., 2020a, 2020b). Despite the importance of the human element, physical assets are also important for organizations (Alsuwaidi et al., 2020; Al Shebli et al., 2021). When minds create, they work to develop and benefit

from these assets and add values to them (Aburayya et al., 2020; Alshurideh, 2022; Taryam et al., 2020). Luthy (1998) also mentions that infrastructure that supports and enables human capital to function, is owned by the organization and remains in the organization when employees leave and includes hardware, software, buildings, processes, patents and trademarks. Roos and Mcdonald (2003) defines it as "consisting of administrative processes, information systems, organizational structure, intellectual property, and any intangible assets owned by a company that do not appear on balance sheet."

Relational capital: The organization is always interested in its external relations, whether it is with customers, partners or suppliers, and from here the importance of relational capital has grown as an important part of intellectual capital (Lee et al., 2022a, 2022b; Shamout et al., 2022a, 2022b). It is the value that results from the level of customer satisfaction, allies, suppliers and all external parties that the organization deals with Alshurideh et al. (2012), Al-Dmour et al. (2021), Alzoubi et al. (2022). Luthy (1998) defined relational capital as the extent of loyalty to customer relationships. As for Mazlan (2005), he worked on identifying the components of relationship capital and defined it as "all the relationships that link the organization with its stakeholders such as suppliers, government agencies, investors and customers, distribution channels, and strategic alliances that the organization establishes."

2.2 Competitive Capabilities

In recent years, the topic of competitive capabilities has received great attention from researchers as a result of rapid developments, economic changes and the emergence of technology, which intensified competition between companies and increased organizations' interest in competitive capabilities (Al-Tarawneh et al., 2012; Al-Hawary et al., 2013a, 2013b; Al-Hawary, 2011a, 2011b; Al-Nady et al., 2013; Al-Hawary & Aldaihani, 2016). For great opportunities that make it compete and rise in the labor market over its competitors, and then it must maintain these capabilities and develop them continuously through creativity, innovation and continuous renewal (Alameeri et al., 2021; Almaazmi et al., 2020; Nuseir et al., 2021). Covin et al. (2010) see that competitive capabilities may be considered as a specific feature or set of advantages that an organization possesses and distinguishes it from other organizations and that the basic work of any organization does not depend only on the process of producing and providing products, but in the ability to continue production and satisfy the continuous, changing and different needs of the market as well. Stevenson (2007) considered competitiveness as the firm's ability to discover and use new methods of production and to develop new products as well.

2.3 Intellectual Capital and Competitive Capabilities

Intellectual capital is one of the most important recent topics that have begun to focus and pay attention to it because of its great importance in increasing the competitive capabilities of organizations (Altamony et al., 2012; Obeidat et al., 2021). Al-Hawajrah (2010) defined intellectual capital as "a group of intangible assets that enable the organization to perform its functions according to a competitive advantage." Both Al-Rousan and Al-Ajlouni (2010: 44) believe that intellectual capital is the most important source of wealth for the organization, as it constitutes a competitive advantage that distinguishes it from other organizations in an environment in which competition has become based on knowledge and skills. Al-Hamdani and Ali (2010) see that intellectual capital as "the value extracted from transforming the tacit knowledge, information, experiences and skills that employees have into tangible forms that can be traded (copyright) and that enable the organization to build a mental stature and distinct relationships with beneficiaries with the aim of competitive advantage." From the point of view of Sharabati et al. (2013) they are organized intangible assets and knowledge of value or those that are used to create value. Guthrie (2001) sees that all the individual capabilities that characterize a specific number of employees in the organization enable them to contribute to increasing the productivity of the organization and raise the level of performance compared to its competitors. The importance of intellectual capital lies in the fact that it enables the organization to possess competitive capabilities that enable it to face competitors. It helps the organization to innovate, achieve what is always better and keep pace with continuous changes in an era characterized by change and rapid development. Based on the above, the hypothesis of the study can be formulated as follows:

There is a statistically significant effect of intellectual capital on competitive capabilities.

3 Study Model

See Fig. 1.

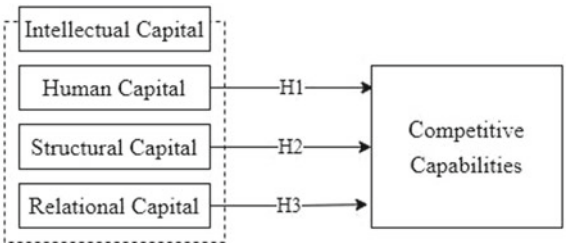

Fig. 1 Research model

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4 Methodology

4.1 Population and Sample Selection

A qualitative method based on a questionnaire was used in this study for data collection and sample selection. The major aim of the study was to examine the impact of intellectual capital on competitive capabilities. Therefore, it focused on industrial firms listed in ASE. Data were primarily gathered through self-reported questionnaires creating by Google Forms which were distributed to a purposive sample of senior managers via email. In total, (167) responses were received including (21) invalid to statistical analysis due to uncompleted or inaccurate. Hence, the final sample contained (146) responses suitable to analysis requirements, where it proved to be sufficient to the extent that was predictable and allowed for a presumption of data saturation (Sekaran & Bougie, 2016).

4.2 Measurement Instrument

A self-reported questionnaire that consists of two main sections along with a section regarding control variables was used as the measurement instrument. Control variables considered as categorical measures were composed of gender, age group, educational level, and experience. The two main sections were dealt with a five-point Likert scale (from 1 = strongly disagree to 5 = strongly agree). The first section contained (14) items to measure intellectual capital based on Stewart (1997). These items were distributed into dimensions as follows: (HC1-HC5) items dedicated for measuring human capital, (SC1-SC4) items dedicated for measuring structural capital, and (IC1-IC5) items dedicated for measuring intellectual capital. Whereas the second section included seven items (CC1-CC7) developed to measure competitive capabilities according to what was pointed by Al-Hawary and Hadad (2016).

5 Findings

5.1 Measurement Model Evaluation

This study was conducted structural equation modeling (SEM) to test hypotheses, which represents a contemporary statistical technique for testing and estimating the relationship between factors and variables (Wang & Rhemtulla, 2021). Accordingly, the reliability and validity of the constructs were tested using confirmatory factor

Table 1 Results of validity and reliability tests

Constructs	HC	SC	IC	CC
HC	**0.769**			
SC	0.625	**0.752**		
IC	0.538	0.498	**0.749**	
CC	0.712	0.703	0.724	**0.787**
VIF	2.418	1.946	2.044	–
Loadings range	0.674–0.835	0.653–0.844	0.698–0.801	0.642–0.883
AVE	0.591	0.566	0.561	0.620
MSV	0.502	0.518	0.497	0.537
Internal consistency	0.875	0.834	0.862	0.916
Composite reliability	0.878	0.838	0.864	0.919

Note HC: human capital, SC: structural capital, IC: intellectual capital, CC: competitive capabilities, Bold fonts indicates to square root of AVE

analysis (CFA) through the statistical program AMOSv24. Table 1 summarizes the results of convergent and discriminant validity, as well the indicators of reliability.

Table 1 shows that the standard loading values for the individual items were within the domain (0.642–0.883), these values greater than the minimum retention of the elements based on their standard loads (Al-Lozi et al., 2018; Sung et al., 2019). Average variance extracted (AVE) is a summary indicator of the convergent validity of constructs that must be above 0.50 (Howard, 2018). The results indicate that the AVE values were greater than 0.50 for all constructs, thus the used measurement model has an appropriate convergent validity. Rimkeviciene et al. (2017) suggested the comparison approach as a way to deal with discriminant validity assessment in covariance-based SEM. This approach is based on comparing the values of maximum shared variance (MSV) with the values of AVE, as well as comparing the values of square root of AVE ($\sqrt{}$AVE) with the correlation between the rest of the structures. The results show that the values of MSV were smaller than the values of AVE, and that the values of $\sqrt{}$AVE were higher than the correlation values among the rest of the constructs. Therefore, the measurement model used is characterized by discriminative validity. The internal consistency measured through Cronbach's Alpha coefficient (α) and compound reliability by McDonald's Omega coefficient (ω) was conducted as indicators to evaluate measurement model. The results listed in Table 1 demonstrated that both values of Cronbach's Alpha coefficient and McDonald's Omega coefficient were greater than 0.70, which is the lowest limit for judging on measurement reliability (De Leeuw et al., 2019).

5.2 Structural Model

The structural model illustrated no multicollinearity issue among predictor constructs because variance inflation factor (VIF) values are below the threshold of 5, as shown in Table 1 (Hair et al., 2017). This result is supported by the values of model fit indices shown in Fig. 1.

The results in Fig. 2 indicated that the chi-square to degrees of freedom (CMIN/DF) was 2.443, which is less than 3 the upper limit of this indicator. The values of the goodness of fit index (GFI), the comparative fit index (CFI), and the Tucker-Lewis index (TLI) were upper than the minimum accepted threshold of 0.90. Moreover, the result of root mean square error of approximation (RMSEA) indicated to value 0.033, this value is a reasonable error of approximation because it is less than the higher limit of 0.08. Consequently, the structural model used in this study was recognized as a fit model for predicting the DEP and generalization of its result (Ahmad et al., 2016; Shi et al., 2019). To verify the results of testing the study hypotheses, structural equation modeling (SEM) was used, the results of which are listed in Table 2.

The results demonstrated in Table 2 show that the highest impact on competitive capabilitieswas for structural capital ($\beta = 0.543$, $t = 22.96$, $p = 0.000$), followed by intellectual capital ($\beta = 0.477$, $t = 19.65$, $p = 0.002$), and finally the lowest impact was for human capital ($\beta = 0.396$, $t = 18.12$, $p = 0.006$). Thus, all the minor hypotheses of the study were supported based on these results.

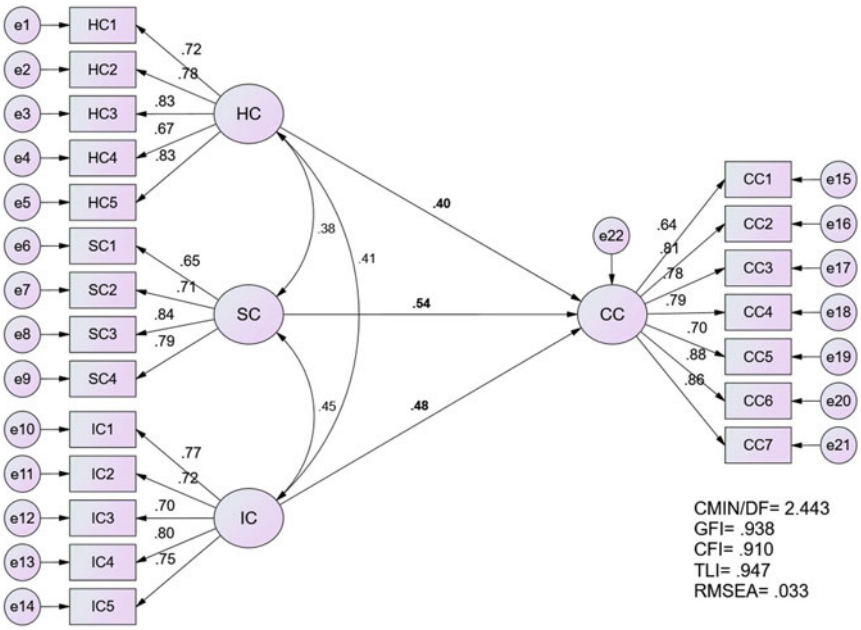

Fig. 2 SEM results of the intellectual capital effect on competitive capabilities

Table 2 Hypothesis testing

Hypothesis	Relation	Standard Beta	*t* value	*p* value
H1	HC → CC	0.396	18.12**	0.006
H2	SC → CC	0.543	22.96***	0.000
H3	IC → CC	0.477	19.65**	0.002

Note HC: human capital, SC: structural capital, IC: intellectual capital, CC: competitive capabilities
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

6 Conclusion

The results of the study indicate the management interest in structural capital through paying attention to developing its managerial processes, paying attention to its organizational structure and its continuous maintenance of infrastructure, which provides a suitable environment for employees to perform work in the best way, which is reflected in the overall performance of the organization. It also indicates that the management pays great attention to its managerial operations and works to develop them, and information systems and databases which are characterized by their integration and development. The management interest in maintaining its infrastructure was appropriate, which means that employees are not sufficiently satisfied with the infrastructure provided by the organization, despite the importance of providing a good infrastructure and maintaining it on an ongoing basis, and thus providing the appropriate environment for work, which encourages workers to perform their work effectively. The organizational structure is appropriate, and this Reflects on the nature, flow and flow of information, which affects the level of performance. The interest came in setting specific standards of performance and comparing the actual performance of employees with these standards, which confirms the poor awareness of the importance of this point and its impact on the level of progress and the level of performance as a whole. The management also has clear and explicit systems that enable it to respond to rapid changes, and the management cooperate with external parties as well to benefit from its expertise when such expertise is needed. Also, the ability to provide part of the budget for scientific research and the ability to reduce costs led to its high competitive capabilities.

7 Discussion

The study reached the acceptance of the main hypothesis that indicates the existence of an impact of the components of intellectual capital on competitive capabilities. This is due to the administration's focus on embodying the dimensions of human capital and its realization that knowledge makes the difference between competitors, and its members have the ability to be creative at work and solve problems effectively, which supports meet human capital requirements, the company's policy

has also contributed to encouraging employees to acquire skills through rotation and development programmes, and thus employees have a great deal of skills and experience, and this is reflected in their competitive capabilities. It was found that there is an impact of structural capital on competitive capabilities, due to the interest in the field of information systems and databases that provide the necessary information at the right time, which supports the decision-making process. It also seeks to adopt policies, procedures, and methods that facilitate the implementation of operations efficiently and effectively and works to continuously review and evaluate its managerial operations to increase the effectiveness of the company. It adopts a flexible organizational structure that improves the performance of operations and individuals and enhances its competitive capabilities. It was also found that there is an impact of relational capital on competitive capabilities, due to the company's interest in its external relations, establishing relations with other organizations, and exchanging information and knowledge with them, which is beneficial and raises its competitive capabilities.

8 Recommendations

In light of the findings of the study, researchers recommend paying attention to intellectual capital by paying attention to scientific competencies and preserving them by all means, providing the appropriate atmosphere to support talents and providing opportunities for ideas that are put forward by workers and put into practice. In addition to the interest in structural capital, it is considered the supporting infrastructure for the organization through the provision of all modern technologies, the continuous development of information systems and databases, and the continuous maintenance of the infrastructure. If the organization has a flexible and strong organizational structure, this enhances its performance to obtain good outputs. Constant keenness to support human capital through the establishment of training and development programs, encouragement of teamwork and the exchange of knowledge, and the appointment must be according to the efficiency standard to reach the desired goals. And strengthening the relational capital, by paying attention to cultural activities, and providing the opportunity to establish human relations between the organization's family, establishing development and communication centers between the organization and the local community, consolidating the relationship between the organization and other organizations working in the same field, exchanging experiences among them, and training workers on technology and means different contact.

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Impact of Knowledge Management on Total Quality Management at Private Universities in Jordan

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Abstract This study aims to know the impact of knowledge management on total quality management in Jordanian private universities. To achieve the objectives of the study, descriptive and analytical approach was adopted, where the researcher

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_94

developed a questionnaire consisting of (35) items. The study population consisted of all (directors of departments, deans of colleges, department heads, administrative staff, and faculty members), where the study followed the simple random method. The results showed a statistically significant effect of knowledge management on total quality management. The study recommended the necessity for universities to organize meetings to exchange knowledge, opinions, experiences and ideas, address problems facing them at work, and promote a culture of openness, sharing, teamwork and dialogue, in a manner that ensures benefit and learning from each other to improve and implement quality programs.

Keywords Knowledge management · Total quality management · Private universities · Jordan

1 Introduction

At the end of the twentieth century, the world witnessed a great momentum in knowledge that led to rapid progress in science and technology, and it was called the fortune of information and communication technology (Alhalalmeh et al., 2020; Allahow et al., 2018; AlTaweel & Al-Hawary, 2021; Al-Nady et al., 2013). After that, knowledge became a necessity rather a strategy because of its impact on human life (Al Mehrez et al., 2020; Shannak et al., 2012). Because of the growing interest in knowledge management and the speed of its application in universities, as it is the most productive for knowledge and the challenges it faces and motivation to reach the competitive advantage (Al-Hawary & Alwan, 2016; Al-Hawary & Al-Hamwan, 2017). Universities tended to follow Total quality management, which is considered as a mechanism to improve organization and individual performance and enhance competitive advantage (Al-Hawary, 2015). It also enhances customer and employee satisfaction, and most importantly, its constant focus on continuous improvement (Abbas, 2019; Al-Hawary & Abu-Laimon, 2013; Al-Hawary & Batayneh, 2010).

The need for knowledge management has recently emerged as a way to address the problem of knowledge and information explosion to use it in solving problems. The ability of organizations, including Jordanian private universities in the northern region, faces a real challenge in gaining and maintaining a competitive advantage, which requires continuous improvement in all its operations and services, aiming to achieve the maximum satisfaction of the requirements and needs of students and employees which forced universities to follow the Total Quality Management along with knowledge management, which will help it achieve a high level of services. Many studies, including Berrish (2016) and Kahreh et al. (2014), have indicated in their recommendations that there is a strong correlation between knowledge management and total quality management and the impact of this integration on improving the performance of services provided in universities.

Looking at the previous theoretical literature, the researcher found many studies that recommend more studies that examine the issue of knowledge management and total quality, especially in the university sector. Thus, this study contributes to enrich the managerial literature with more studies; the results of the study may help universities to identify what is applied in terms of knowledge management, total quality, and what needs to be applied, as well as to benefit from the results in order to provide them with the best services (Al Kurdi et al., 2020a, 2020b; Al-Maroof et al., 2021; Alshurideh et al., 2021). Hence, this study came to focus on knowledge management and total quality management as one of the modern intellectual advances and modern perspectives as it helps the institutions, they follow to create the required development and improvement, as well as raise the effectiveness and efficiency of their various activities (Aljumah et al., 2021; AlMehrzi et al., 2020; Altamony et al., 2012). In order to answer the study's question, what is the impact of knowledge management on total quality management in Jordanian private universities?

2 Theoretical Framework and Making Hypothesis

2.1 Knowledge Management

Contemporary institutions, such as higher education institutions, witness a flow of rapid developments in the world today most importantly the information and technological revolution that relies on scientific knowledge and the best use of information which resulted from the great development in the Internet. Because of these developments, knowledge has become the strategic source in creating advantage and the most powerful and effective factor in the success or failure of the institution (Schwandt & Marqurdt, 2003).

Organizations have proactively engaged in knowledge management in the hope of improving performance through better management of what they know and possess (Miković et al., 2020). Knowledge management discusses a systematic and integrative procedure that helps organizations find, organize, distribute and transfer important evidence, knowledge, and experiences that are essential to actions such as problem solving, self-motivated education, strategic planning, and decision-making to achieve organizational goals (Danish et al., 2014; Lawson, 2013).

Al-Hawary (2015) defined knowledge management as the process of capturing, coordinating and preserving information and experiences of individuals and groups within an organization and providing it to others. Knowledge management has also been defined as a policy of giving the right knowledge to the right people at the right time to help people share that knowledge and put it into practice, in ways that attempt to expand the performance of the organization (Al-Hawary & Al-Namlan, 2018; Al-Hawary et al., 2020; Al-Lozi et al., 2017, 2018; Tayal et al., 2015).

Kor and Maden (2013) defined knowledge management as a process that allows the organization to create new knowledge and facilitate the use of existing knowledge

when needed. Moreover, Knowledge management was defined by Obeid and Rabay'a (2016) as the processes that help the organization to acquire, organize, generate and share knowledge, as well as transfer important relevant information to various managerial activities by the organization such as decision-making, problem solving, learning and strategic planning. It was also defined as a process that allows individuals within the organization to obtain the correct data and information at the right time and coordination (Bolisani & Bratianu, 2018).

Knowledge management includes a set of sub-processes that help the organization in acquiring, developing, organizing, applying, sharing and transforming the knowledge, information and experience into management activities that improve the decision-making process, strategic planning and competitive advantage. In addition, it aims to improve the efficiency and effectiveness of the productivity and performance of managers, achieve organizational goals and enhance the competitive position of the institution (Al-Qatawneh, 2019).

Knowledge management practices or processes help organizations to use internal knowledge and take advantage of external resources, which leads to create value and improve innovative performance (Ferraris et al., 2017). Briefly, we assume that knowledge management has its own life cycle and processes, and therefore we need to manage it according to the stages of this cycle (Mikovic, 2019).

Knowledge management processes or practices are originally defined as the application of a systematic approach to the activities of obtaining, structuring, and managing and sharing knowledge throughout the organization in order to achieve faster and better work (Alameeri et al., 2020; Nonaka & Takeuchi, 1995). Many previous studies have attempted to define and classify knowledge management practices, as (Alavi & Leidner, 2001) classified knowledge management processes into four dimensions, which are knowledge acquisition, knowledge storage, knowledge sharing and knowledge application. (Becerra-Fernandez and Sabherwal, 2014) indicated that knowledge management processes include four dimensions, which are knowledge discovery, knowledge acquisition, knowledge exchange and knowledge application. (Malkawi & Abu Rumman, 2016) used six dimensions to describe knowledge management practices, which are knowledge acquisition, knowledge innovation, knowledge storage, knowledge exchange, knowledge application, and finally knowledge protection. According to Ramadan et al. (2017) it includes five processes, which are knowledge acquisition, knowledge innovation, knowledge sharing, knowledge application, and knowledge documentation. In this study, four dimensions were used (knowledge acquisition, knowledge sharing, knowledge storage, and knowledge application).

Knowledge Sharing: The process of knowledge sharing refers to the stage of transformation or productivity that ensures the dissemination and record of knowledge (Akour et al., 2021; Wong & Aspinwall, 2005)**.** Knowledge sharing also refers to the process through which individuals, experiences, and information are shared together; thus, this increases the organization's resources and reduces the waste of time in tries and errors. In addition, (Birasnav, 2014) said it is a process by which explicit or tacit knowledge is transferred to other people through the communication that occurs between them.

Knowledge Application: Knowledge application is the vital element in knowledge management processes, as it is considered an output aspect in knowledge management. The process of knowledge application can be defined as the process of implementing knowledge for the beneficiary of the facility. The perspective which is based on knowledge considers the process of applying knowledge the last step that attempts to solve problems and achieve a comparative advantage over competitors (Alshurideh, 2016; Choi et al., 2010). Moreover, it is considered as an activity that can enhance the application of knowledge of a new scenario and learning from it.

Knowledge Storage: It is not enough to generate and acquire new knowledge for decision-making purposes, as mechanisms are needed to store and retrieve it when necessary. So, we can define knowledge storage as storing existing and acquired in properly indexed knowledge. According to (Obeidat et al., 2016), it is the process of identifying new information as it is relevant and necessary for current and future use, as well as store it in reasonable forms to be easily accessible in the organization.

Knowledge Acquisition: Al-Sa'di et al. (2017) defines knowledge acquisition as the process through which the organization obtains knowledge from internal and external sources, which is the process of taking knowledge from different people such as suppliers, customers, employees, etc. for continuous improvement in operations, products and services (Johnson et al, 2019).

2.2 Total Quality Management

Because of technological, social, political and environmental changes that have occurred over the past few years, the ability of the organization to gain and maintain a competitive advantage has become a real challenge (Al-Hawary & Hadad, 2016; Al-Hawary & Ismael, 2010; Al-Hawary & Obiadat, 2021; Mohammad et al., 2020). These changes have not only led to more choices for customers, but also led to a change in their preferences and demands (Al-Hawary, 2013; Al-Hawary & Aldaihani, 2016; Al-Hawary & Al-Smeran, 2017; Al-Hawary et al., 2013, 2017; Alolayyan et al., 2018; Alshurideh et al., 2017; Metabis & Al-Hawary, 2013). Hence, total quality management has been identified as a mechanism that has the ability to improve organization and individual performance, and strengthen competitive advantage (Alzoubi et al., 2021; Li et al., 2018).

Total quality management is one of the many quality-based methods, which began in Japan after World War II and spread to the United States of America in the eighties, mostly in American manufacturing companies that face competition from Japan. Moreover, total quality management is a management view that seeks to integrate all organizational purposes from marketing to finance, design, engineering, production and customer service to emphasize all customer needs and organizational goals (Alzoubi et al., 2020; Obeidat et al., 2016). In addition, Wang et al. (2012) said that it is a continuous procedure for the development of individuals and the entire

organization, and the continuous development of processes inside organizations to provide greater value to customers and meet their needs. It also includes company processes that focus on acceptance, participation and response to customers through the concept of marketing.

Bouranta et al. (2017) defined total quality management as a science that depends on a set of rules, methods, equipment and theoretical methodologies. Modgil and Sharma (2016) defined it as a philosophy that aims to change for the better and protect the quality of the commodity and the process on an ongoing basis. This continuous improvement is the outcome of the he committed work of senior management and the participation of suppliers, customers and employees. As well as, it is considered the management philosophy that focuses on continuous improvement for all operations of the institution. Marefal and Fraidfathi said that it is a customer-based philosophy in which the sourcing business, business processes and institution culture are managed and blended in a good way to ensure customer satisfaction.

Wang et al. (2012) defined it as a consistent measure of development for individuals and the entire organization. Total quality management can be defined as a philosophy or a tool aims to increase the quality of products, services and process, as well as achieve competitive advantage and align quality with the company's mission, vision and goal through the application and commitment of senior management, employee empowerment, continuous improvement, resource management and customers.

2.3 Knowledge Management and Total Quality Management

A few researchers have recently expressed their interest in the relationship between total quality management and knowledge management, but they did not agree on the perception of this relationship. Some researchers consider knowledge management as a facilitator for Total Quality Management (Stewart & Waddell, 2008), at which from one perspective, knowledge management is identified as an activator of total quality management. Stewart and Waddell (2008) stated that expanding the concept of quality to product and service specifications as a quick response to customer needs clarifies the relationship between knowledge management and Total Quality Management.

The acquisition and sharing of knowledge also lead to finding a quality culture which create an understandable framework according to quality and knowledge management programs (Al-Salti & Hackney, 2011; Alshamsi et al., 2020; Alshurideh, 2022). On the other hand, there are many approaches assume that total quality management agree with knowledge management. Lin and Lee (2005) introduced ISO9000 processes based on knowledge management system, which support the flow of knowledge in the organization. In a case study revealed that Total Quality Management practices are factors that facilitate knowledge acquisition and sharing. Choo et al. (2007) presented a conceptual framework based on quality and knowledge management programs. Based on this study, quality programs are effective

factors for knowledge management. Jayawarana and Holt (2009) analyzed the relationship between knowledge creation and transformation in the context of research and development; and based on their case study, they concluded that total quality management practices improve knowledge creation and transformation. In addition, Molina et al. examined the relationship between total quality management and knowledge transformation.

According to Hsu and Shen (2005), the relationship between total quality management and knowledge management as management practices appears close, as they share some processes such as results direction, people-based management, leadership and customer satisfaction; whereas similarities form the interactive relationship between the two practices (Leonard & Mccadam, 2001). Ooi et al. (2010) conducted an empirical study to measure the impact of total quality management on knowledge management. The results showed that total quality management is highly associated with knowledge sharing. Moreover, the results showed that there is a positive relationship between training, teamwork and financial analysis with knowledge exchange among middle management employees (Alshurideh et al., 2019a, b; Al Kurdi et al., 2020a, b). In addition, (Zwain et al., 2011) evaluated the relationship between the basic elements of total quality management and knowledge sharing. They also stressed that there is a positive relationship between the elements of total quality management and knowledge sharing, and that the basic elements must be implemented entirely and not individually to obtain the best results by sharing knowledge (Aburayya et al., 2020; Al-Khayyal et al., 2021; Zu'bi et al., 2012). Based on the above, the hypothesis of the study can be as follows:

There is a statistically significant effect of knowledge management on total quality management in private universities in Jordan.

3 Study Model

See Fig. 1.

4 Methodology

4.1 Population and Sample Selection

A qualitative method based on a questionnaire was used in this study for data collection and sample selection. The major aim of the study was to examine the impact of knowledge management on total quality management. Therefore, it focused on Jordan-based universities operating in the north region. Data were primarily gathered through self-reported questionnaires created by Google Forms which were distributed

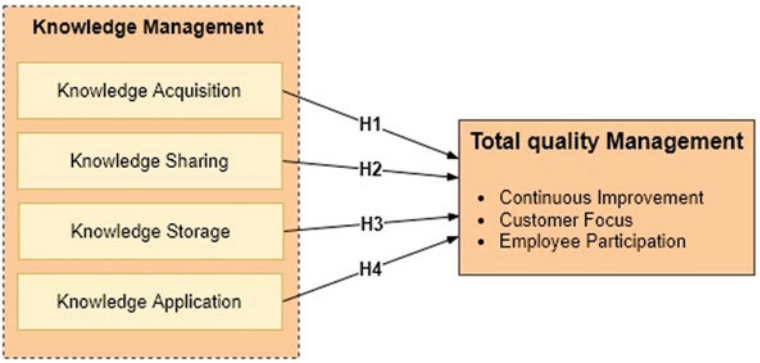

Fig. 1 Research model

to a random sample of (520) employees via email. In total, (331) responses were received including (28) invalid to statistical analysis due to uncompleted or inaccurate. Hence, the final sample contained (303) responses suitable to analysis requirements that were formed a response rate of (58.3%), where it proved to be sufficient to the extent that was predictable and allowed for a presumption of data saturation (Sekaran & Bougie, 2016).

4.2 Measurement Instrument

A self-reported questionnaire that consists of two main sections along with a section regarding control variables was used as the measurement instrument. Control variables considered as categorical measures were composed of gender, age group, educational level, and experience. The two main sections were dealt with a five-point Likert scale (from 1 = strongly disagree to 5 = strongly agree). The first section contained (20) items to measure knowledge management based on (Al-Hawary, 2015). These questions were distributed into dimensions as follows: five items dedicated for measuring knowledge acquisition, five items dedicated for measuring knowledge sharing, five items dedicated for measuring knowledge storage, and five items dedicated for measuring knowledge application. Whereas the second section included (15) items developed to measure total quality management according to what was pointed by (Al-Hawary & Abu-Laimon, 2013). This construct divided into three first-order constructs. Continuous improvement was measured through five items, customer focus was measured by five items, and employee participation was measured using five items.

5 Findings

5.1 Measurement Model Evaluation

This study was conducted structural equation modeling (SEM) to test hypotheses, which represents a contemporary statistical technique for testing and estimating the relationship between factors and variables (Wang & Rhemtulla, 2021). Accordingly, the reliability and validity of the constructs were tested using confirmatory factor analysis (CFA) through the statistical program AMOSv24. Table 1 summarizes the results of convergent and discriminant validity, as well the indicators of reliability.

Table 1 shows that the standard loading values for the individual items were within the domain (0.654–0.891), these values greater than the minimum retention of the elements based on their standard loads (Al-Lozi et al., 2018; Sung et al., 2019). Average variance extracted (AVE) is a summary indicator of the convergent validity of constructs that must be above 0.50 (Howard, 2018). The results indicate that the AVE values were greater than 0.50 for all constructs, thus the used measurement model has an appropriate convergent validity. Rimkeviciene et al. (2017) suggested the comparison approach as a way to deal with discriminant validity assessment in covariance-based SEM. This approachis based on comparing the values of maximum shared variance (MSV) with the values of AVE, as well as comparing the values of square root of AVE ($\sqrt{}$AVE) with the correlation between the rest of the structures. The results show that the values of MSV were smaller than the values of AVE, and that the values of $\sqrt{}$AVE were higher than the correlation values among the rest of the constructs. Therefore, the measurement model used is characterized by discriminative validity. The internal consistency measured through Cronbach's Alpha coefficient (α) and compound reliability by McDonald's Omega coefficient (ω) was conducted as indicators to evaluate measurement model. The results listed in Table 1 demonstrated that both values of Cronbach's Alpha coefficient and McDonald's Omega coefficient were greater than 0.70, which is the lowest limit for judging on measurement reliability (de Leeuw et al., 2019).

5.2 Structural Model

The structural model illustrated no multicollinearity issue among predictor constructs because variance inflation factor (VIF) values are below the threshold of 5, as shown in Table 1 (Hair et al., 2017).This result is supported by the values of model fit indices shown in (Figs. 1 and 2).

The results in Fig. 1 indicated that the chi-square to degrees of freedom (CMIN/DF) was 1.973, which is less than 3 the upper limit of this indicator. The values of the goodness of fit index (GFI), the comparative fit index (CFI), and the Tucker-Lewis index (TLI) were upper than the minimum accepted threshold of 0.90.

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Table 1 Results of validity and reliability tests

Constructs	1	2	3	4	5	6	7
1. KAC	*0.773*						
2. KSH	0.517	*0.765*					
3. KST	0.492	0.439	*0.762*				
4. KAP	0.395	0.547	0.517	*0.768*			
5. CIM	0.553	0.622	0.598	0.625	*0.773*		
6. CFO	0.617	0.602	0.638	0.589	0.628	*0.786*	
7. EPA	0.587	0.638	0.608	0.661	0.637	0.667	*0.774*
VIF	1.978	2.648	2.335	1.879	–	–	–
Loadings range	0.731–0.817	0.654–0.864	0.702–0.872	0.691–0.836	0.685–0.891	0.725–0.834	0.664–0.846
AVE	0.598	0.586	0.581	0.589	0.597	0.618	0.600
MSV	0.501	0.428	0.487	0.521	0.497	0.517	0.521
Internal consistency	0.879	0.872	0.870	0.875	0.877	0.888	0.878
Composite reliability	0.881	0.875	0.873	0.877	0.880	0.890	0.881

Note KAC: knowledge acquisition, KSH: knowledge sharing, KST: knowledge storage, KAP: knowledge application, CIM: continuous improvement, CFO: customer focus, EPA: employee participation, italic fonts indicate to root square of AVE

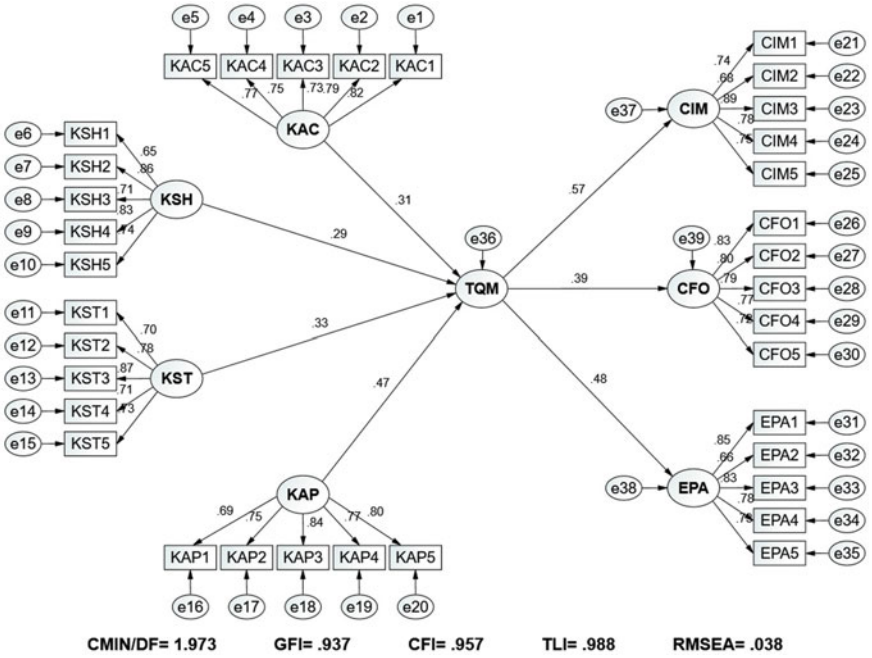

Fig. 2 SEM results of the knowledge management effect on total quality management

Moreover, the result of root mean square error of approximation (RMSEA) indicated to value 0.038, this value is a reasonable error of approximation because it is less than the higher limit of 0.08. Consequently, the structural model used in this study was recognized as a fit model for predicting the DEP and generalization of its result (Ahmad et al., 2016; Shi et al., 2019).To verify the results of testing the study hypotheses, structural equation modeling (SEM) was used, the results of which are listed in Table 2.

Table 2 Impact of knowledge management dimensions on total quality management

Hypothesis	Relation	Standard Beta	*t* value	*p* value	Result
H1	KAC→TQM	0.312	10.395	0.000	Supported
H2	KSH→TQM	0.297	8.103	0.000	Supported
H3	KST→TQM	0.335	11.902	0.000	Supported
H4	KAP→TQM	0.468	17.212	0.000	Supported

Note KAC: knowledge acquisition, KSH: knowledge sharing, KST: knowledge storage, KAP: knowledge application, TQM: total quality management
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

The results demonstrated in Table 2 show that knowledge managementhas a positive impact relationship on total quality management. Moreover, the results indicated that the highest impact was for knowledge application ($\beta = 0.468$, $t = 17.212$, $p = 0.000$), followed by knowledge storage ($\beta = 0.335$, $t = 11.902$, $p = 0.000$), then knowledge acquisition ($\beta = 0.312$, $t = 10.395$, $p = 0.000$), and finally the lowest impact was for knowledge sharing ($\beta = 0.297$, $t = 8.103$, $p = 0.000$).

6 Discussion

The results of the study showed that there is an impact of knowledge management on total quality management in Jordanian private universities. This result is consistent with what was stated in the studies by Hashem and Jaradat and Honarpour et al., which indicated that there is an impact of knowledge management on total quality management. Also, this result is in line with, who confirmed that the practices of Total Quality Management and knowledge management are corresponded to each other; the reason is that university employees have benefited from knowledge management in supporting university administration decisions and encourage them to present their suggestions and opinions, improve the process of managing internal documents and provide them to beneficiaries, share knowledge inside and outside the university and make qualitative improvement in the educational process because of its great importance for improving work; this is because total quality is a flexible participatory process.

The results indicated that there is an impact of the acquisition of knowledge on total quality management, so that universities integrate the components of knowledge they have with knowledge they acquired from abroad, which led to an improvement in the quality of knowledge provided to students and satisfy their educational requirements. The university's interest in motivating creative and innovative employees led to accept and interact with the wise ideas proposed by the employees after evaluating and implementing these proposals, which contribute to the process of continuous improvement in the university. The university also provides programs that simplify and facilitate the provision, development and improvement of services that create an advantage over other competitive universities. The results indicated that there is an impact of knowledge storage on total quality management in Jordanian private universities in the north region, whereas university workers can easily access the information and documents stored in the university databases, and document the acquired knowledge of each project they accomplish. In addition, reliance on electronic documents led to the ease of finding documents, completing transactions, and taking appropriate procedures at the right time, making it easier for workers to improve the quality of services in a high and correct manner.

The results indicated that there is an impact of sharing knowledge on total quality management in Jordanian private universities in the North Region, as the university employees share information related to their work because there are valid and easy communication ways between the various sites and departments, which leads

to finding appropriate solutions to the problems they face and taking preventive immediate procedures constantly. The results indicated that there is an impact of knowledge application on total quality management in Jordanian private universities in the north region. University workers use their knowledge in their work field which leads to improve the efficiency and effectiveness of their work quality. Moreover, the university administration discussing ideas and the outcomes of its work in formal meetings leads to involve employees at all levels, express their opinions, focus on students' satisfaction and respond quickly to their requirements, listen to their comments and complains which will help the university avoid shortcomings and increase the efficiency of their work. This will enhance student satisfaction as they are the core of the university's work.

7 Recommendations

Based on the results of this study, the study recommends Jordanian private universities to pay attention to the application of knowledge management and total quality by reviewing the best international practices in their application, and benefiting from that in improving and developing the quality of services they provide. It is also preferable for universities to organize meetings between them and the employees to exchange knowledge, opinions, experiences and ideas, address problems they face at work, promote the culture of openness partnership, teamwork and dialogue in order to ensure benefit and learning from each other to improve and implement quality programs. Moreover, it should establish a rapid mechanism for responding to the requirements of total quality and continue working on meeting the needs and requirements of students in the best way.

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The Effect Knowledge Creation Process on Organizational Innovation in Social Security Corporation in Jordan

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Abstract The aim of this study is to identify the effect knowledge creation process on organizational innovation in Social Security Corporation in Jordan. To achieve the objectives of the study, a questionnaire was prepared consisting of (47) items. The

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_95

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study population consists of all (Managers of departments, Directors of directorates, Heads of departments and staff), who perform their duties in Social Security Corporation in Jordan. The number of employees was about (435) employees. Where the study followed the method of comprehensive survey to withdraw the sample study. The study reached there is an effect of the process of creating knowledge on organizational innovation in the Social Security Corporation in Jordan. The study recommended that knowledge management should be adopted as an input to improve the levels of individual and organizational innovation, through the establishment of an independent department in Social Security Corporation in.

Keywords Knowledge creation process · Organizational innovation · Social security corporation · Jordan

1 Introducing

The current era is characterized by rapid changes in globalization, information and communication technology, which presents many opportunities and challenges for all organizations in order to obtain the competitive strength to survive, continue to work efficiently and effectively to face these changes (Allahow et al., 2018; Al-Hawary & Al-Syasneh, 2020; AlTaweel & Al-Hawary, 2021; Al-Maroof et al., 2021). Perhaps it is distinguished by the emergence of the power of knowledge; so whoever can use it well possesses the competitive power that enables him to survive in light of these changes and challenges, and in the same context, the concept of the rule of the era of knowledge led to increase its role and importance by providing information and thinking about it (Al-Hawary et al., 2020; Al Mehrez et al., 2020). Therefore, the administrative thought focused on knowledge processes and their management to ensure that the organization achieves its desired goals, responds to continuous changes and adapts easily. In addition to training, developing and motivating human resources as it is considered an effective and important factor to enhance levels of organizational innovation, production capabilities and excellence of organizations, as the priority occupied by human capital in the knowledge economy has led to an intense struggle for the talented, the creative, and the brilliant minds (Al-Hawary & Alwan, 2016; Kabrilyants et al., 2021; Tariq et al., 2022).

Organizational innovation is considered a goal for organizations that are interested in knowledge management and its operations, due to the intensity of local and global competition in most fields (Al-Hawary, 2015; Al-Hawary & Aldaihani, 2016; Al-Hawary & Al-Namlan, 2018; Al-Hawary & Nusair, 2017; Al-Lozi et al., 2017, 2018; Alzoubi et al., 2022). And because the value of organizations lies in the available human resources, this prompts them to pay attention to their knowledge to reach the creativity they seek. As developed countries have made progress and superiority through talented and creative minds where their abilities, skills and energies have been utilized; so the specialists in measuring the progress of countries are based on the number of scholars and thinkers, as well as the resulting degree

of knowledge and creative accumulation (Jawad et al., 2006; AlHamad et al., 2022; Alshurideh et al., 2022).

The most prominent problems that public organizations in Jordan suffer from are the lack of an appropriate climate, an appropriate work environment, and a culture that supports knowledge management as well as its operations that contribute to support and improve levels of organizational innovation in them. Moreover, these organizations face many challenges such as the difficulty of strategic prediction for their future, mission and goals. In addition to the financial pressures, bureaucratic complications, regulations and laws they face, and all of the foregoing severely impede the effective implementation of knowledge management initiatives and operations, looking for an increase in the levels of innovation, which is a vital and effective element in Raising the performance levels of employees, thus achieving success and excellence.

In light of the foregoing, the General Organization for Social Security in Jordan needs a comprehensive knowledge management system because of its importance, as it plays a vital and effective role in making public administration jobs more efficient by raising the levels of innovation among employees, it also contributes in supporting social goals for the public sector through searching for opportunities and large projects that allow society to flourish, progress and prosperity, in addition to enabling organizations and their members to work at high levels of performance, in order to improve the quality and quality of community life. Therefore, this study is a starting point for future training and development programs, the results and recommendations also help in interpreting the results of previous researches that dealt with some aspects of the subject, and use the findings of the research to support its results, as well as providing researchers with documented information derived from the field study, in addition to trying to attract the attention of researchers to direct their future research towards the variables of this study. So, this study came to test the impact of the knowledge creation process in achieving organizational innovation.

2 Theoretical Framework and Creating Hypotheses

2.1 Knowledge Creation

Nonaka (1994) pointed out that the process of creating knowledge lies mainly in the difference between tacit knowledge and explicit knowledge, as it made available and expanded entirely new knowledge by individuals, as well as that it had formed and documented knowledge with the knowledge of the organization; despite the formation of ideas in the minds of individuals, the interaction among these individuals plays an important role in its development, and this indicates that close cooperation and coordination between individuals within groups or work teams contributes to the expansion and development of completely new knowledge that extends across the borders of the organization. Toyama et al. (2000) added, it is a process by which

the individual excels himself by transcending his old ideas, thinking more broadly and with a holistic thought to move to new ideas in order to acquire new content that keep pace with the changes and developments at the local and global levels. Gottschal (2008) stressed that this process leads to the creation of valuable ideas that contribute to solving problems and offering opportunities for development and superiority, as it includes developing new content or replacing the available content with new content through the processes of cooperation, consultation and effective coordination between individuals or groups; In addition, creativity is the basis in the process of creating knowledge.

Many researchers point out that creating and sharing knowledge is not a natural and automatic act, because knowledge often exists in the minds of individuals, but they face difficulties in transferring and sharing it with others, especially when facilities and support are not available from the management of the organization (AlMehrzi et al. 2020; Shannak et al., 2012). Magnier-Watanabe et al. (2011) and Elinfoo (2005) emphasized that the essence of knowledge management processes focuses on the process of creating and forming knowledge by employing the existing knowledge accumulation in the organization to create new knowledge or taking advantage of the organization's employees' interactions with its markets and competitive environment to create new knowledge.

Researchers in the field of knowledge management were interested in studying and analyzing the mechanisms of creating and forming organizational knowledge through the interaction of individuals, work teams, and groups in the internal environment of the organization, or in the external work environment or both, where they presented several models for the transformations of knowledge and the stages of its creation, formation and development. (Nonaka and Takeuchi) model for the process of creating and creating knowledge remains one of the most important and influential models on the development of the literature of knowledge transfer and management.

Therefore, this model is considered one of the most prominent models used in the process of creating knowledge, and it is called the Nonaka spiral, and it includes four stages of transformation of knowledge: (Socialization, Externalization, Combination, and Internalization), to represent a model designed to understand the dynamics of creating and forming knowledge in organizations through the availability of two types of Knowledge, which is tacit knowledge and explicit knowledge, as well as the dynamic interaction between them within three main levels of interaction, namely individuals, groups and the organization (Al-Hawary & Alwan, 2016; Alshurideh, 2022; Alzoubi et al., 2021). It is worth noting that Nonaka et al. (2000), presented a description of each stage of the four knowledge creation process as follows:

- **Socialization**: It is the stage at which new tacit knowledge is created through the exchange of experiences, ideas and technical skills between individuals. Socialization appears in human relationships at work, outside work or both, where mental and theoretical models are produced to the world.
- **Externalization**: It is the stage, at which tacit knowledge is highlighted and transformed into explicit knowledge, and it happens through oral communication using language in discussions and collective thinking, as the transformation of tacit

knowledge into explicit knowledge is logically and systematically crystallized to be easily shared.

- **Combination**: It is the stage at which explicit knowledge is transformed into more complex and systematic explicit knowledge, such as: (conducting research and preparing reports), where explicit knowledge is collected from a variety of different sources, and then combined, organized and coordinated to form new explicit knowledge, to be shared between many groups through the means and methods of distributing and sharing written documents, and electronic publishing.
- **Internalization**: It is the stage at which explicit knowledge is self-characterized, and transformed into tacit knowledge, where knowledge is understood by all members of the organization, and this is done in several ways such as: (training, experiments, and repeating the performance of tasks).

2.2 Organizational Innovation

Innovation is a vital and important element for organizations, because the skills and abilities required for their survival and to perform their role to the fullest, will be different from what they were in the past, as organizations at the present time and in the future will face a wave of many challenges and opportunities, as well as rapid and sharp changes, and this requires them to respond quickly and find appropriate ways and methods to adapt to them in a flexible manner (Almaazmi et al., 2020; Al Suwaidi et al., 2020; Alameeri et al., 2021; Nuseir et al., 2021). Therefore, perceptive organizations will seek to employ talented individuals and groups, in order to find ideas and creative solutions that will elevate the organization and raise its levels of performance and ability to exploit opportunities and face various challenges and threats (Al-Nady et al., 2013, 2016; Alshurideh et al., 2017; Alolayyan et al., 2018; Al-Hawary & Alhajri, 2020; Mohammad et al., 2020; Alhalalmeh et al., 2020; Al-Hawary & Obiadat, 2021).

Organizational innovation, it is a process through which the organization uses all its knowledge, skills, and technical systems in order to develop completely new goods or services or to improve and develop its operating systems and programs to raise the level of response to the needs and desires of the beneficiaries and to gain their satisfaction and loyalty to them (Jones, 2001). Guilford (1959) defined organizational innovation as a set of preparatory features that include (fluency in thinking, flexibility, sensitivity to problems and authenticity), as well as redefining the problem and clarifying it in detail.

The researchers differed on defining the elements of administrative innovation, but they agreed on a group of them (Altamony et al., 2012; Allahow et al., 2018). Fluency, means the individual's ability to present or produce a large number of synonyms, alternatives, uses or ideas, when confronting and responding to a specific event, situation or stimulus, as well as speed in generating it. Flexibility, means the ability of the individual to present various and different ideas in addition to his ability to change or transform his point of view, vision, or path of thinking according to the

course and requirements of the event or problem, and sensitivity to problems; it also means the individual's ability to discover various problems, weaknesses and gaps in the problem, the issue or situation. Internalization means the individual's ability to present or produce something unconventional, unusual, amazing or rare and unique in the long run, where scientists point out that the idea is not completely original and new unless no one preceded it and was unfamiliar and far-reaching.

2.3 Knowledge Management Processes and Organizational Innovation

The basics of the knowledge creation process (Socialization, Externalization, Combination, and Internalization) affect innovation in the organization, so organizations must focus in their main activities on learning and knowledge management processes, and then use knowledge theory to find a specific direction to coordinate activities related to transformation and knowledge creation processes, in order to prove the value of brilliant minds for the active and continuous existence in society (Rowley, 2000). Chapman and Magnusson (2006) pointed out that knowledge is an essential component of all forms of creativity, as well as it is a widely accepted principle of innovation management. Stacey (2000) emphasizes that knowledge is one of the most vital assets as it is the main source of innovation and excellence, but there is no simple and generally accepted definition of knowledge, as knowledge differs from data and information, but it is related to both, unlike data and information, where knowledge emerges from human interpretations and their complex interactions. Rahimi et al. (2011) explained that the knowledge creation process can be seen as a spiral or ascending process from the individual level to the group level, then to the organizational level, and sometimes to the inter-organizational level; but innovation is the basis of problem solving, and to occur, it must not be limited to the exchange of knowledge only, but must be used and recombined, and sometimes the distinction between the creation and use of knowledge appears to be particularly reflected when confronted with complex systems such as innovation because it is the result of a combination of existing and new knowledge, and therefore the process of compiling new and current knowledge depends largely on the creation and use of knowledge; and in the next generation of knowledge management the importance of knowledge creation and use has been greatly emphasized to create value and became critical factors in the creative process. Alberto (2000), points out that the relationship between knowledge management processes and organizational innovation is of great importance to the success of competitive organizations, as well as its impact on the formulation of competition strategies, because the development of knowledge is linked to the characteristics and capabilities of individuals, and this supports the innovation of the organization and its competitive capabilities. Awad and Ghaziri (2004) noted the relationship between knowledge management processes and organizational innovation, which lies in the fact that the knowledge

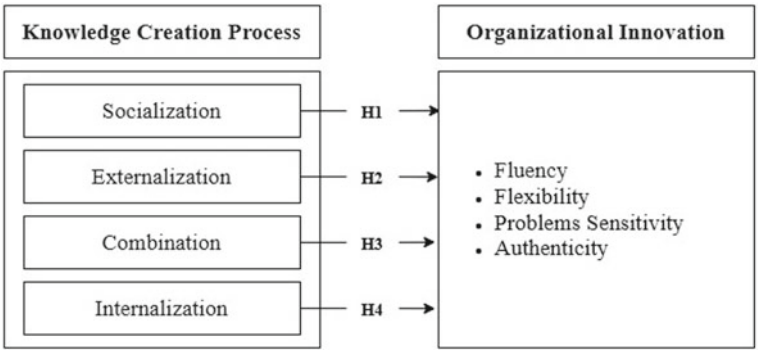

Fig. 1 Research model

capabilities of organizations have turned into processes that allowed them to create new products and services very quickly, or to modify and develop them quickly as well, in addition to their speed in providing them to beneficiaries in a distinctive way; this is because knowledge management processes, especially the process of creating knowledge, play an important role in influencing and advancing the levels of organizational innovation, as innovation cannot take place without it, especially in the current era, as it supports and provides individuals with new knowledge that will enhance their creative ideas in various fields, as well as It lights their way to original and unique ideas. Accordingly, the study hypothesis can be formulated as follows:

There is a statistically significant effect at the significance level ($0.05 \geq \alpha$) of the knowledge creation process on organizational innovation in the Public Institution for Social Security in Jordan.

3 Study Model

See Fig. 1.

4 Methodology

4.1 Population and Sample Selection

A qualitative method based on a questionnaire was used in this study for data collection and sample selection. The major aim of the study was to examine the impact of knowledge creation process on organizational innovation. Therefore, it focused

on Jordan-based social security corporation. Data were primarily gathered through self-reported questionnaires creating by Google Forms which were distributed to all employees at general administration of social security corporations via email. In total, (379) responses were received including (32) invalid to statistical analysis due to uncompleted or inaccurate. Hence, the final sample contained (347) responses suitable to analysis requirements that were formed a response rate of (79.8%), where it proved to be sufficient to the extent that was predictable and allowed for a presumption of data saturation (Sekaran & Bougie, 2016).

4.2 Measurement Instrument

A self-reported questionnaire that consists of two main sections along with a section regarding control variables was used as the measurement instrument. Control variables considered as categorical measures were composed of gender, age group, educational level, and experience. The two main sections were dealt with a five-point Likert scale (from 1 = strongly disagree to 5 = strongly agree). The first section contained (24) items to measure knowledge creation processbased on (Chatterjee et al., 2018; Li et al., 2018; Al-Adamat et al., 2020; Prompreing & Hu, 2021). These questions were distributed into dimensions as follows: seven items dedicated for measuring socialization, six items dedicated for measuring externalization, five items dedicated for measuring combination, and six items dedicated for measuring internalization. Whereas the second section included (23) items developed to measure organizational innovation according to what was pointed by Silva and Cirani (2020). This variable was a second-order construct divvied into four first-order constructs. Fluency was measured through five items, flexibility was measured through six items, problems sensitivity was measured by six items, and authenticity was measured using six items.

5 Findings

5.1 Measurement Model Evaluation

This study was conducted structural equation modeling (SEM) to test hypotheses, which represents a contemporary statistical technique for testing and estimating the relationship between factors and variables (Wang & Rhemtulla, 2021). Accordingly, the reliability and validity of the constructs were tested using confirmatory factor analysis (CFA) through the statistical program AMOSv24. Table 1 summarizes the results of convergent and discriminant validity, as well the indicators of reliability.

Table 1 shows that the standard loading values for the individual items were within the domain (0.537–0.945), these values greater than the minimum retention of the elements based on their standard loads (Al-Lozi et al., 2018; Sung et al., 2019). Average variance extracted (AVE) is a summary indicator of the convergent validity

Table 1 Results of validity and reliability tests

Constructs	1	2	3	4	5	6	7	8
1. SOC	**0.784**							
2. EXT	0.387	**0.764**						
3. COM	0.485	0.527	**0.732**					
4. INT	0.594	0.439	0.521	**0.723**				
5. FLU	0.625	0.511	0.618	0.438	**0.763**			
6: FLE	0.581	0.637	0.594	0.494	0.374	**0.748**		
7. PSE	0.499	0.552	0.541	0.567	0.439	0.492	**0.769**	
8. AUT	0.614	0.482	0.558	0.634	0.552	0.502	0.513	**0.725**
VIF	1.624	1.513	2.334	1.504	–	–	–	–
Loadings range	0.684–0.846	0.642–0.945	0.681–0.775	0.657–0.774	0.622–0.841	0.713–0.791	0.537–0.882	0.674–0.781
AVE	0.614	0.584	0.536	0.523	0.583	0.560	0.591	0.522
MSV	0.554	0.429	0.374	0.415	0.502	0.487	0.515	0.497
Internal consistency	0.905	0.889	0.848	0.864	0.871	0.880	0.892	0.865
Composite reliability	0.917	0.892	0.852	0.867	0.874	0.884	0.894	0.867

Note SOC: socialization, EXT: externalization, COM: combination, INT: internalization, FLU: Fluency, FLE: flexibility, PSE: problems sensitivity, AUT: authenticity, Bold fonts refers to $\sqrt{\text{AVE}}$

of constructs that must be above 0.50 (Howard, 2018). The results indicate that the AVE values were greater than 0.50 for all constructs, thus the used measurement model has an appropriate convergent validity. Rimkeviciene et al. (2017) suggested the comparison approach as a way to deal with discriminant validity assessment in covariance-based SEM. This approach is based on comparing the values of maximum shared variance (MSV) with the values of AVE, as well as comparing the values of square root of AVE ($\sqrt{}$AVE) with the correlation between the rest of the structures. The results show that the values of MSV were smaller than the values of AVE, and that the values of $\sqrt{}$AVE were higher than the correlation values among the rest of the constructs. Therefore, the measurement model used is characterized by discriminative validity. The internal consistency measured through Cronbach's Alpha coefficient (α) and compound reliability by McDonald's Omega coefficient (ω) was conducted as indicators to evaluate measurement model. The results listed in Table 1 demonstrated that both values of Cronbach's Alpha coefficient and McDonald's Omega coefficient were greater than 0.70, which is the lowest limit for judging on measurement reliability (De Leeuw et al., 2019).

5.2 Structural Model

The structural model illustrated no multicollinearity issue among predictor constructs because variance inflation factor (VIF) values are below the threshold of 5, as shown in Table 1 (Hair et al., 2017). This result is supported by the values of model fit indices shown in (Figs. 1 and 2).

The results in Fig. 1 indicated that the chi-square to degrees of freedom (CMIN/DF) was 1.287, which is less than 3 the upper limit of this indicator. The values of the goodness of fit index (GFI), the comparative fit index (CFI), and the Tucker-Lewis index (TLI) were upper than the minimum accepted threshold of 0.90. Moreover, the result of root mean square error of approximation (RMSEA) indicated to value 0.045, this value is a reasonable error of approximation because it is less than the higher limit of 0.08. Consequently, the structural model used in this study was recognized as a fit model for predicting the DEP and generalization of its result (Ahmad et al., 2016; Shi et al., 2019). To verify the results of testing the study hypotheses, structural equation modeling (SEM) was used, the results of which are listed in Table 2.

The results demonstrated in Table 2 show that all knowledge creation process dimensions have a positive impact relationship on organizational innovation except externalization which has no impact on organizational innovation ($\beta = 0.031$, $t = 0.498$, $p = 0.624$). However, the results indicated that the highest impact was for combination ($\beta = 0.338$, $t = 5.657$, $p = 0.000$), followed by socialization ($\beta = 0.285$, $t = 4.781$, $p = 0.000$), and finally the lowest impact was for internalization ($\beta = 0.196$, $t = 3.735$, $p = 0.000$).

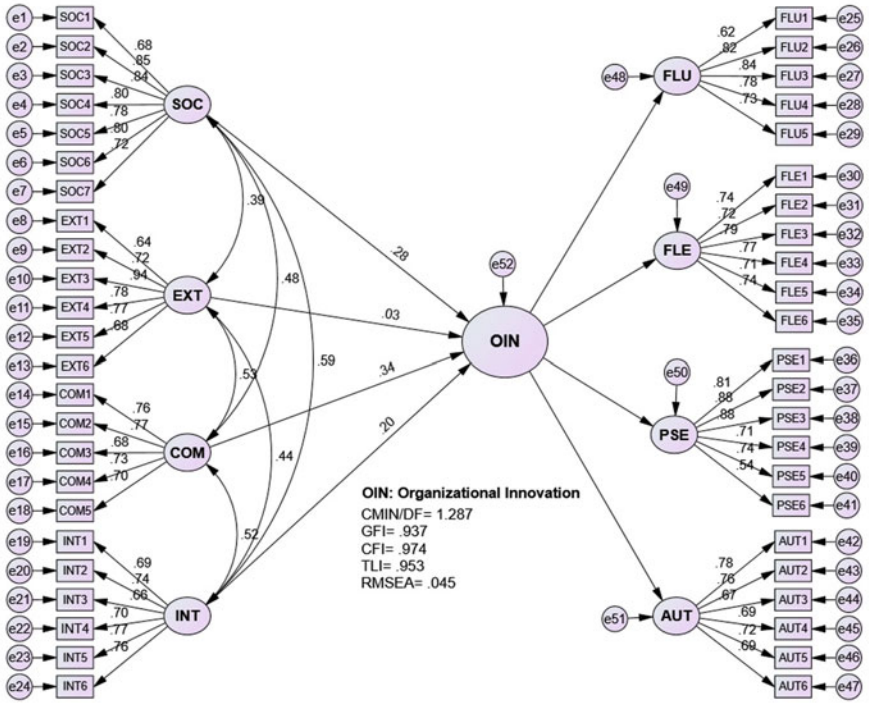

Fig. 2 SEM results of the knowledge creation process effect on organizational innovation

Table 2 Hypothesis testing

Hypothesis	Relation	Standard beta	*t* value	*p* value
H1	Socialization→Organizational Innovation	0.285	4.781	0.000
H2	Externalization→Organizational Innovation	0.031	0.498	0.624
H3	Combination→Organizational Innovation	0.338	5.657	0.000
H4	Internalization→Organizational Innovation	0.196	3.735	0.000

Note * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

6 Discussion

The results showed the interest of the Social Security Corporation in the availability of experts in knowledge to train its employees on new knowledge to use in their work, in addition to giving them opportunities to think about what was discussed and support it with ideas and creative proposals, and to encourage everyone who supports knowledge with practical additions that can be benefited from and improved in work, in addition to the institution's interpretation of knowledge results obtained and saved in a comprehensive knowledge base so that everyone can access it to benefit from

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it in his field of work. The results of the study also showed that the institution's work environment and culture encourage the sharing of information and experiences among its employees, in addition to the institution encouraging its employees to participate in meetings and discussions when ideas and information are needed to accomplish various work, as well as providing material and moral incentives in a way to motivate and support its employees. Moreover, the results confirmed that the institution is interested in providing expert teams and technological systems to help its employees organize their ideas, present them and share them with everyone, in addition to encouraging them to review new knowledge related to work to benefit from them and achieve more understanding; as well as the institution evaluating the quality of knowledge and updating it from time to time; the institution also supports its employees with practical examples to help them explain and clarify their ideas when they cannot express them, in addition to involving them in decision-making by supporting their creative ideas and proposals, but in return the institution must work to overcome the difficulties that limit the ability of its employees to express their ideas regarding work and its development. The results also confirmed the ability of employees to defend their ideas with argument and proof, when they presented the largest number of ideas and quick solutions to confront work problems, in addition to their ability to retrieve previous ideas and information to solve the problems they face at work, in addition to the realization of most employees who always find that work procedures need a continuous development process, as well as the employees' quest to discover new things; moreover, their abilities to accomplish the work assigned to them in a renewed manner. The employees also showed the high ability to propose solutions to face work problems after knowing the shortcomings or weaknesses in the work they do. In addition to their medium ability to discover problems experienced by others and plan to solve them, as well as sometimes predict them before they occur, and their ability to make some changes in work methods from time to time, in addition to their medium ability to adapt to new work variables, see things from different sides and think quickly about working conditions and requirements.

The results of the study showed and found an impact of the knowledge creation process on organizational innovation in the Social Security Corporation in Jordan, because the Social Security Corporation is interested in (socialization) through the process of sharing experiences and information in order to create tacit knowledge such as mental models and joint technical skills; (Combination) through a process of systematically compiling and organizing the explicit knowledge that is available with explicit knowledge related to the work of the institution; (Internalization) by transforming explicit knowledge into tacit knowledge; (Personality) through training and repeating the performance of tasks, taking suggestions and ideas and supporting them, so that explicit knowledge becomes assimilated as tacit knowledge. But on the other hand, there is a clear weakness and less interest from the institution in (Externalization) through the process of accurately identifying and improving the tacit knowledge related to the work and then transforming it into explicit knowledge through interviews, discussions and meetings, and this result agreed to some extent with the studies by Young, Berraies and Chaher, and Huang and Wang.

7 Recommendations

In light of the results that have been reached, the study recommends the need to adopt knowledge management as an entrance to improve the levels of individual and organizational innovation, through the establishment of an independent department in the Public Institution for Social Security in Jordan, under the name (Knowledge Management) appearing in the organizational structure; and the necessity for the Social Security Corporation in Jordan to provide systems, methods and ways that support the process of sharing and exchanging tacit (personal) knowledge related to work among its employees, Which would enhance their innovation levels, thus raising the level of their performance at work; as well as the necessity of adopting the Public Institution for Social Security in Jordan, strategies that contribute to supporting employees and opening the way for them to express their ideas and creative proposals related to work and its development with ease. As well as providing specialized technological systems and tools to help its employees organize their information, ideas and suggestions, display them in exemplary ways, and share them with their colleagues, in addition, the institution train them on these systems through expert teams.

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The Effect of Marketing Knowledge on Competitive Advantage in the Food Industries Companies in Jordan

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Abstract This study aimed to identify the impact of marketing knowledge practices on the competitive advantage of the food industries companies in Jordan. In order to achieve the objectives of the study, the questionnaire was used to collect primary data, whereby the study population consisted of (160) administrators of all levels (senior management, middle management) and who numbered (16) food industry

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_96

companies. The questionnaire was distributed to the study sample, which included (160) administrators, and the researcher approved the sample the comprehensive survey and the descriptive analytical approach as it is appropriate to achieve the objectives of the study. One of the most important findings of the study is that there is a positive effect of marketing knowledge on the competitive. The study recommended the management of foods industries companies to provide the ability to process and analyze the information they possess in order to correctly forecast market demands, as well as employ delegates to study different markets, and worked to increase cooperation with suppliers and customers to follow up new developments in the market.

Keywords Marketing knowledge · Competitive advantage food industries companies · Jordan

1 Introduction

Business organizations use many factors of power in the context of facing the external environment variables, which are changing rapidly, and among these factors is knowledge, where organizations of all kinds can perform their work in a way that achieves competitiveness and entrepreneurship and is ahead of competitors in the field of activity that the organization is engaged in (Altamony et al., 2012; Al-Hawary & Al-Syasneh, 2020; AlTaweel & Al-Hawary, 2021; Obeidat et al., 2021). Marketing activity is the basis on which the organization relies to serve its markets appropriately, and this can only be achieved through the possession of those who carry out this activity with sufficient knowledge of market factors and variables from competitors and customers (Al Mehrez et al., 2020; Al-Hawary et al., 2011; Alshurideh, 2022; Alshurideh et al., 2017). Knowledge enables business organizations to understand the market, and how to deal with competitors by meeting the needs and desires of customers, which made there a need for marketing knowledge that enables the appropriate identification of the target market sector in light of the increasing competitiveness among business organizations, and thus directing the marketing mix that suits these sectors, which leads to enhancing the target market share (Al-Hawary & Alwan, 2016; Al-Lozi et al., 2017; Alshurideh, 2019; Alshurideh et al., 2020; Sweiss et al., 2021).

Competitive advantage expresses the organization's central characteristics, capabilities and efficiency, and also identifies the aspects in which the organization excels from other organizations. Dimensions of competitive advantage include improving internal efficiency, customer orientation, alliances and response to customers, cost reduction, awareness, flexibility and creativity (Al-Nady et al., 2016; Allahow et al.,

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2018; Alhalalmeh et al., 2020; Al-Hawary et al., 2020; Mohammad et al., 2020). Business organizations can achieve and maintain competitive advantage in the presence of high competitiveness through innovation, improvement and development through continuous dynamic processes and not through individual events.

Marketing knowledge is an effective pillar in formulating various marketing plans that will achieve a competitive advantage, and given the many great challenges facing business organizations that stand in front of their aspirations to achieve development and growth, this imposes the need to fortify the competitive position of these organizations through the knowledge they possess with all competitors, customers, as well as suppliers who deal with these organizations, and knowing the current and future needs of the market so that these organizations can keep pace with what is happening in the market according to a new vision derived from its accurate diagnosis of the current reality (Al-Hawary & Alhajri, 2020; Al-Hawary & Obiadat, 2021; Al-Maroof et al., 2021). From the reality of the researcher's work in one of the food industries companies, he found that these companies lack appropriate marketing knowledge to enable them to know the market and the needs of customers, which creates several challenges for these companies to achieve competitive advantage (Al Kurdi et al., 2020a, 2020b; Khasawneh et al., 2021; Alzoubi et al., 2021). Therefore, this study comes to reveal the impact of marketing knowledge on the competitive advantage in food industries companies in Jordan.

2 Literature Review and Hypothesis Development

2.1 Marketing Knowledge

In light of the rapid changes in the movement of markets worldwide, marketing takes great importance at the level of work of business units in organizations, as without effective marketing strategic planning, companies cannot achieve the desired goals of marketing strategies, except by relying on knowledge that is characterized as a the only resource that builds up cumulatively and is used to generate and develop new ideas. Recent studies have shown the multiple role of knowledge in all fields, and the conviction of individuals and organizations of the importance of knowledge has increased. Hence, industrial companies seek to obtain knowledge from its sources, arrange, classify, store, and make it available in an easy and easy way to benefit from it (Alshurideh et al., 2012; Al-Hawary, 2015; Lee et al., 2022a, 2022b; Shamout et al., 2022).

There are several definitions of knowledge, Al-Hawary and Alwan (2016) defined knowledge as "the individual's ability to recognize and distinguish things" or "the ability that the individual possesses and stores in his mind in the form of cognitive maps". Al-Benaa and Qassem (2012) indicates that there are several approaches to clarify the concept of Knowledge, some of them focus on the economic approach, considering the intellectual capital owned by the organization, and others focus on

the information approach, considering that knowledge is the extent of the ability to deal with information to transform it into permanent knowledge in the organization in order to employ it to achieve goals, while the technical approach considers them as technological capabilities that enable the organization to achieve excellence, and finally portrayed by the social approach as a social structure based on communication between individuals**.**

Al-Hawary et al. (2020) focused on creating, collecting, organizing and storing this knowledge for dissemination and exploitation by transforming knowledge into collaborative knowledge that can be shared within the organization. In order to implement it correctly, knowledge management and its processes within the organization must be properly adopted through an integrative, cumulative process that consists over long periods of time to become available for application and use in order to address specific problems and conditions. Organizations rely on knowledge to interpret the available information about a particular case, and to make a decision about how to manage and treat this case (Allahow et al., 2018; Alshurideh et al., 2021; Alwan & Alshurideh, 2022).

Macintosh (1998), Laudon and Laudon (2015), Becerra-Fernandez and Sabherwal (2014) and Campeanu-Sonea and Sonea (2016) dealt with several definitions of knowledge management, most of which were based on the fact that it is a discipline that focuses on analyzing the knowledge that can be obtained so as to link the knowledge assets (explicit and implicit) in all its internal and external operations, as knowledge management is based on the discovery, acquisition, sharing and application of knowledge in all units, in order to ensure the achievement of organizational goals. From here, we find that knowledge management is an essential aspect in permanent learning companies, as this supports the mechanism of sharing and reusing the knowledge of individuals or companies' knowledge through information technology such as the document management system, work groups, e-mail, and various databases that make up the knowledge sharing system integrates with additions of individuals and teams who use this system (Al-Hawary et al., 2013; Al-Dhuhouri et al., 2020).

Marketing knowledge management is based on being one of the most important skills for companies to acquire, create, retain and share knowledge based on the marketing environment, in order to build an information base on competitive market variables and identify target markets for use in making strategic marketing decisions (Alaali et al., 2021; Al-Hawary et al., 2017). Al-Hawary and Al-Namlan (2018) believes that the management of marketing knowledge in the organization is largely based on knowing all the information about the market, what are the movements of competitors, what are the desires and needs of customers, and the changes that have occurred, all of which prompted an attempt to integrate marketing activities into an organizational framework that leads to the human dimension which is represented in the tacit and explicit knowledge of employees, and linking this to information technology to form basic pillars in creating a marketing knowledge management system and promoting participatory, which enhances the accumulation of knowledge, retains and develops it, and enhances knowledge sharing among workers at all managerial

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levels, and thus develops the skills of workers, this, in turn, affects the support of the relationship with the customer and the identification of his desires and needs and how these needs and desires can be satisfied, which leads to achieving the competitive advantage of the organization in the target markets that it aspires to reach.

To enable the company to focus on the markets; You must generate information about customer needs, and the factors that influence customers, by collecting and responding to information by designing and implementing products and services that meet customer needs (Al-Hawary & Abu-Laimon, 2013; Al-Hawary & Harahsheh, 2014; Al-Hawary et al., 2017; Al-Lozi et al., 2018; Zebal & Others, 2019) indicated that marketing knowledge represents a graphic knowledge "know-what" that exists independently and must be distinguished and known from marketing skills or procedural knowledge "know-how". In the same direction, indicated that marketing knowledge represents both the codified information in the marketing databases of companies and the development of research skills that allow the application of this information for the benefit of the company. It is not only the codified information that managers possess, but also the refinement of personal skills for finding, evaluating, and using this information.

Marketing knowledge enables organizations to link better with existing customers, and to define the target customer more accurately. The dimensions of marketing knowledge in this research are indicated according to the following classification. First: Knowledge of the market: Knowledge of the market enables business organizations to identify the needs and desires of customers, their characteristics and interests about the nature of the products and services provided to benefit from them when designing the marketing mix for various products and services. Second: Knowledge of Suppliers: Knowledge of suppliers is important, as it includes knowledge of organizations that equip and provide the organization with the necessary resources that are important in producing goods and providing various services. Third: Knowledge of the customer: Knowledge of customers is based on understanding the needs and desires and discovering them in a renewed way by interacting with him and tracking his behavior, providing the value that satisfies him and acquiring the value that satisfies the organization, which includes knowledge from the customer and knowledge about the customer and knowledge of the customer, and the success and continuity of the company depends on accurate understanding For the customer as he is the cornerstone of the marketing process at the present time, so the organization must find many channels of mutual communication with him to identify his needs and desires and work to produce and provide goods and services of high quality, the lowest price, the greatest benefit and the safest and to align it with his needs and desires in a way that achieves his satisfaction to improve the image of the organization in his mind. Fourth: Product knowledge: Product knowledge includes clarity of the characteristics of the products that customer's desire and those characteristics that the organization desires to present, so that the organization can satisfy the needs of customers and the market." Fifth: Knowledge of competitors: Knowledge of competitors represents the source of the ability to confront competitors, and although competitors seek to make

their knowledge difficult to imitate, however, competitors' businesses, products, and services provide opportunities for organizations to learn by analyzing their strengths and weaknesses (Alolayyan et al., 2018; Al-Dmour et al., 2021).

2.2 Competitive Advantage

The concept of competitive advantage emerged as one of the important topics in the field of business management, and the competitive advantage refers to the organization's ability to formulate and apply strategies that achieve distinction in front of competing companies, which operate in the same activity of this organization, and this can only be done through an optimal exploitation of the capabilities and resources of the organization; Financial, technical and organizational, in addition to the capabilities of competencies and knowledge of workers in this organization, through which they can apply and design competitive strategies, and this concept is related to the concept of perceived value to customers, and the extent of the organization's ability to achieve distinction among other organizations (Munizu, 2013). Competitive advantage has been defined as: "a set of factors that have a direct and indirect relationship to the organization's stability in the market, which includes the organization's effective participation in economic fields that affect stability and the development of profits, by actively employing material and human resources (Baroto et al., 2012). Al-Nady et al. (2013) defined competitive advantage as the most appropriate management that aims to discover new, innovative and creative ways to produce and provide goods and services more effectively than those offered by competitors in the market, where it is able to embody these methods on the ground, creating a innovative process that outperforms its competitors.

The competitive advantage of companies expresses their ability to attract customers, build a good image for them, improve their satisfaction and add serious value to their products (Baah & Jin, 2019). There are two types of models related to competitive advantage: the resource-based model, and the market-based model. These two models complement each other, and each of these two models includes variables, as the competitive advantage model that is based on the market includes variables such as differentiation, cost, effectiveness and evaluation of competitors, and the risks and threats facing the organization, while the model of competitive advantage, which is based on resources, it includes All the resources owned by the organization are material, financial or human, so that the movement and development are from within the organization (Korankey, 2013; AlHamad et al., 2022; Alshurideh et al., 2022; Hasan et al., 2022).

Due to developments and environmental changes and the changing needs and desires of the customer over time, the competitive dimensions have changed and developed. Thus, the success of the organization depends on determining the appropriate dimension on the basis of which it competes, which directly affects the organization's strategy and its entire performance. These are the main factors that achieve the organization excellence and superiority over competitors in the long term through

its ability to identify the needs and desires of its target market and the possibility of satisfying these needs and desires in a way better than its competitors. The organization works on translating those needs and desires into certain indications that constitute the dimensions on which the organization will compete, and these dimensions constitute the competitive advantages (Al-Nady et al., 2013). The researchers differed in defining these dimensions, some of them identified them with five dimensions, and some identified them with six or more. However, they mostly agreed in four dimensions; delivery, quality, cost, flexibility (Al-Hawary et al., 2011; Alzoubi et al., 2021).

2.3 Marketing Knowledge and Competitive Advantage

Marketing knowledge has been studied by many researchers, Munyoro and Nyereyemhuka emphasized that the culture of customer relationship management leads to better performance, with strategies that use the needs and expectations of customers as a way to create a continuous culture to manage customer relationship. According to Abubakar and Mohammad (2019), companies looking for ways to improve the quality of decisions to improve their production lines in order to enhance competitive advantage. While Zebal and others: made five main proposals for business organizations to take advantage to improve the performance of their business in the markets, by adopting the internal and external approach to the management of tacit and explicit knowledge. In an attempt to understand market orientation to accelerate market innovation, define competitive advantage, and build performance**.** Na et al. (2019) researched marketing innovation, sustainable competitive advantage, and performance and confirmed that functional coordination of market cultural orientation increases product innovation, according to Hasniaty, Asram and Basmar (2018), improving marketing performance improves competitive advantage; as efficiency, innovation, information technology, facilities and infrastructure improve the company's performance and in terms of new products from which a competitive advantage can be built.

Husseini et al. (2018) refered to the existence of a relationship between efficiency, product quality, innovation and new product development. Competitive advantage may be achieved as a result of developing a new product strategy, and marketing knowledge management may create a sustainable competitive advantage because there is a positive role for marketing knowledge management to improve performance and reach a sustainable competitive advantage (Rezaee & Jafari, 2015). Marketing knowledge can also be used to improve the marketing communications of retailers in small and medium-sized businesses to obtain appropriate knowledge from customers and feedback to meet their needs and help win new customers (Marcek & Mucha, 2015). As knowledge management can affect the competitiveness of projects, knowledge management can help to make the company in a better position in terms of the effectiveness and efficiency of its activity, and thus enable the company to achieve a competitive advantage with the need to harmonize all characteristics of marketing

knowledge depending on the environment and activity of the company (Semaskiene & Stancikiene, 2014). Based on Based on the above theoretical literature, the study hypothesis can be formulated as follows:

There is a statistically significant effect at the significance level ($\alpha < 0.05$) of marketing knowledge on the competitive advantage of food industries companies in Jordan.

3 Study Model

See Fig. 1.

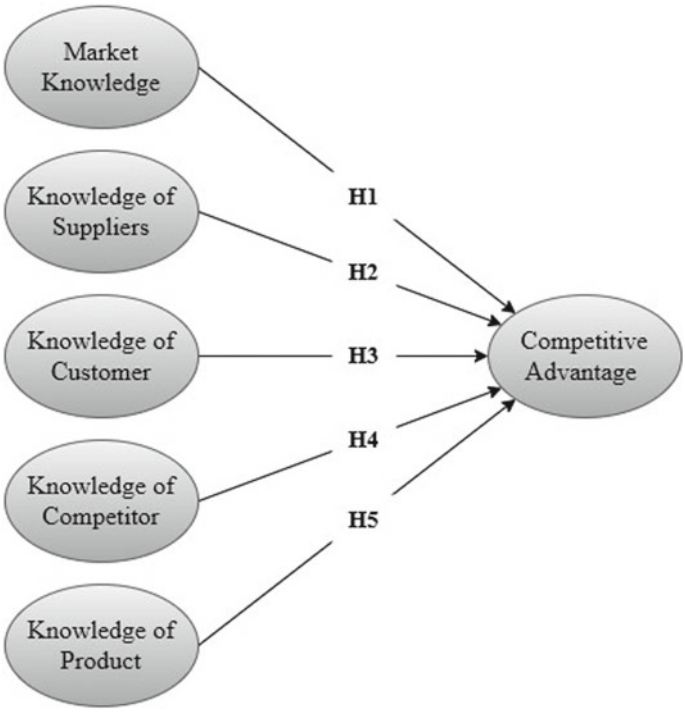

Fig. 1 Research model

4 Methodology

4.1 Population and Sample Selection

A qualitative method based on a questionnaire was used in this study for data collection and sample selection. The major aim of the study was to examine the impact of marketing knowledge on competitive advantage. Therefore, it focused on Jordan-based companies operating in the food industry sector in Abdullah II Ibn Al-Hussein Industrial City. Data were primarily gathered through self-reported questionnaires created by Google Forms which were distributed to a purposive sample of managers at high and middle levels via email. In total, (160) responses were received including (10) invalid to statistical analysis due to uncompleted or inaccurate. Hence, the final sample contained (150) responses suitable to analysis requirements that were formed a response rate of (93.7%), where it proved to be sufficient to the extent that was predictable and allowed for a presumption of data saturation (Sekaran & Bougie, 2016).

4.2 Measurement Instrument

A self-reported questionnaire that consists of two main sections along with a section regarding control variables was used as the measurement instrument. Control variables considered as categorical measures were composed of gender, age group, educational level, and experience. The two main sections were dealt with a five-point Likert scale (from 1 = strongly disagree to 5 = strongly agree). The first section contained (26) items to measure marketing knowledge based on (Al-Hawary & Alwan, 2016). These questions were distributed into dimensions as follows: five items dedicated for measuring market knowledge, five items dedicated for measuring knowledge of suppliers, five items dedicated for measuring knowledge of customers, six items dedicated for measuring knowledge of competitors, and five items dedicated for measuring knowledge of products. Whereas the second section included eight items developed to measure competitive advantage according to what was pointed by ((Distanont & Khongmalai, 2018; Yasa et al., 2020).

5 Findings

5.1 Measurement Model Evaluation

This study was conducted structural equation modeling (SEM) to test hypotheses, which represents a contemporary statistical technique for testing and estimating the relationship between factors and variables (Wang & Rhemtulla, 2021; Al-Adamat et al., 2020; Al-Gasawneh et al., 2020). Accordingly, the reliability and validity of the constructs were tested using confirmatory factor analysis (CFA) through the statistical program AMOSv24. Table 1 summarizes the results of convergent and discriminant validity, as well the indicators of reliability.

Table 1 shows that **the** standard loading values for the individual items were within the domain (0.673–0.854), these values greater than the minimum retention of the elements based on their standard loads (Al-Lozi et al., 2018; Sung et al., 2019). Average variance extracted (AVE) is a summary indicator of the convergent validity of constructs that must be above 0.50 (Howard, 2018). The results indicate that the AVE values were greater than 0.50 for all constructs, thus the used measurement model has an appropriate convergent validity. Rimkeviciene et al. (2017) suggested the comparison approach as a way to deal with discriminant validity assessment in covariance-based SEM. This approach is based on comparing the values of maximum shared variance (MSV) with the values of AVE, as well as comparing the

Table 1 Results of validity and reliability tests

Constructs	1	2	3	4	5	6
1. KMA	**0.755**					
2. KSU	0.527	**0.752**				
3. KCU	0.374	0.438	**0.743**			
4. KCO	0.422	0.527	0.502	**0.734**		
5. KPR	0.502	0.498	0.496	0.449	**0.774**	
6. COA	0.624	0.597	0.602	0.625	0.597	**0.761**
VIF	3.727	1397	2.311	2.646	2.648	–
Loadings range	0.681–0.825	0.718–0.831	0.682–0.802	0.685–0.792	0.687–0.837	0.673–0.854
AVE	0.570	0.566	0.553	0.538	0.599	0.579
MSV	0.418	0.502	0.468	0.513	0.484	0.511
Internal consistency	0.866	0.861	0.857	0.872	0.880	0.911
Composite reliability	0.869	0.867	0.860	0.875	0.882	0.916

Note KMA: market knowledge, KSU: knowledge of suppliers, KCU: knowledge of customers, KCO: knowledge of competitors, KPR: knowledge of products, COA: competitive advantage, Bold font indicates to root square of AVE

values of square root of AVE ($\sqrt{}$AVE) with the correlation between the rest of the structures. The results show that the values of MSV were smaller than the values of AVE, and that the values of $\sqrt{}$AVE were higher than the correlation values among the rest of the constructs. Therefore, the measurement model used is characterized by discriminative validity. The internal consistency measured through Cronbach's Alpha coefficient (α) and compound reliability by McDonald's Omega coefficient (ω) was conducted as indicators to evaluate measurement model. The results listed in Table 1 demonstrated that both values of Cronbach's Alpha coefficient and McDonald's Omega coefficient were greater than 0.70, which is the lowest limit for judging on measurement reliability (de Leeuw et al., 2019).

5.2 Structural Model

The structural model illustrated no multicollinearity issue among predictor constructs because variance inflation factor (VIF) values are below the threshold of 5, as shown in Table 1 (Hair et al., 2017).This result is supported by the values of model fit indices shown in (Figs. 1 and 2).

The results in Fig. 1 indicated that the chi-square to degrees of freedom (CMIN/DF) was 2.514, which is less than 3 the upper limit of this indicator. The values of the goodness of fit index (GFI), the comparative fit index (CFI), and the Tucker-Lewis index (TLI) were upper than the minimum accepted threshold of 0.90. Moreover, the result of root mean square error of approximation (RMSEA) indicated to value 0.036, this value is a reasonable error of approximation because it is less than the higher limit of 0.08. Consequently, the structural model used in this study was recognized as a fit model for predicting the DEP and generalization of its result (Ahmad et al., 2016; Shi et al., 2019).To verify the results of testing the study hypotheses, structural equation modeling (SEM) was used, the results of which are listed in Table 2.

The results demonstrated in Table 2 show that marketing knowledge dimensions had a positive impact relationship on competitive advantage except knowledge of customers ($\beta = 0.054$, $t = 0.267$, $p = 0.092$). However, the results indicated that the highest impact was for market knowledge ($\beta = 0.363$, $t = 2.418$, $p = 0.001$), followed by knowledge of products ($\beta = 0.251$, $t = 2.161$, $p = 0.003$), then knowledge of suppliers ($\beta = 0.190$, $t = 2.209$, $p = 0.002$), and finally the lowest impact was for knowledge of competitors ($\beta = 0.102$, $t = 1.474$, $p = 0.041$).

6 Discussion

The management of food industries companies is keen to deliver their products at a specific time to achieve financial return and gain customer satisfaction and loyalty, and to ensure quality and the ability to control activities and optimal use

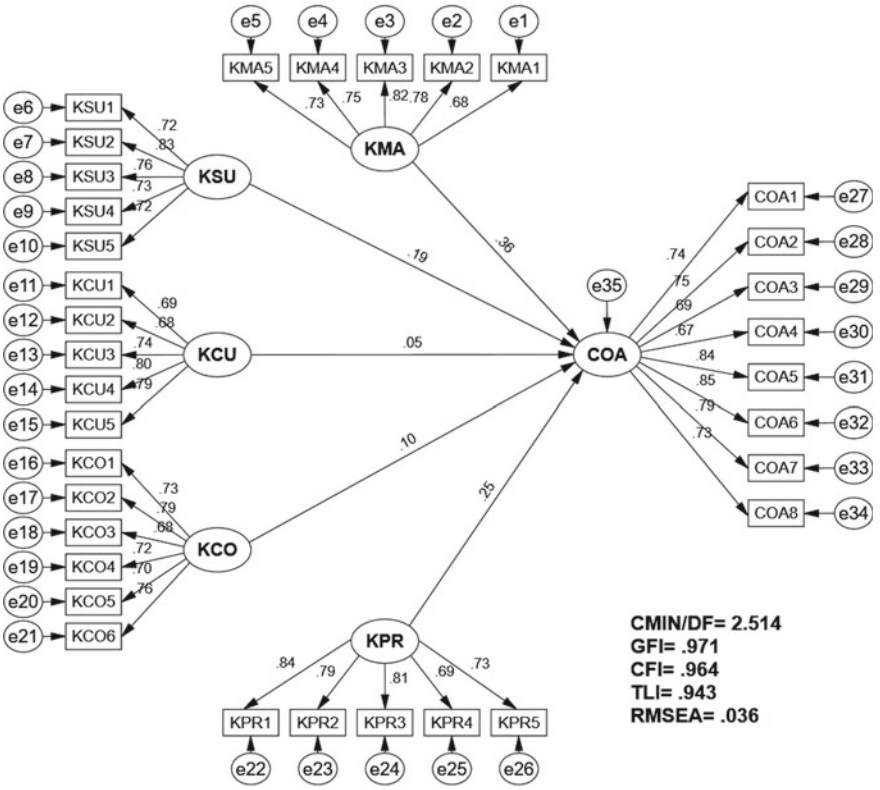

Fig. 2 SEM results of the marketing knowledge effect on competitive advantage

Table 2 Hypothesis testing

Hypothesis	Relation	Standard Beta	*t* value	*p* value	Result
H1	KMA→COA	0.363	2.418	0.001	Supported
H2	KSU→COA	0.190	2.209	0.002	Supported
H3	KCU→COA	0.054	0.267	0.092	Not supported
H4	KCO→COA	0.102	1.474	0.041	Supported
H5	KPR→COA	0.251	2.161	0.003	Supported

Note KMA: market knowledge, KSU: knowledge of suppliers, KCU: knowledge of customers, KCO: knowledge of competitors, KPR: knowledge of products, COA: competitive advantage
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

of its available resources to reach the largest segment, and to ensure that tasks are completed at the specified cost, and its ability to reduce prices and speed to respond to customers' requests, flexibility, simplification of transactions, and speed of response

to customer requirements, which may create a competitive advantage over competitors. The results of the study showed that there is an impact of marketing knowledge on the competitive advantage in food industries companies in Jordan. It is clear to the researcher the impact of marketing knowledge on the competitive advantage, and that this effect stems from the keenness of the food industry companies to review, develop and constantly improve knowledge of the market, suppliers, customer, competitor, and product because of their conviction that these improvements with knowledge will benefit them in improving competitive advantage through accuracy of delivery, quality control, cost reduction and flexibility. This view is supported by Al-Mardini, Karthikeyan, Razaee and Jafari (2015). According to the results of the study, food industries companies in Jordan, through their officials, recognized the importance of providing effective channels of communication with the customer in the success of delivery and quality control of the various procedures. The keenness and commitment of the food industry companies to work with high efficiency reduce costs and achieve flexible procedures without delay.

7 Recommendations

Based on the findings of the study, researchers recommend managers and decision makers in food industries companies to provide the ability to process and analyze the information they possess in order to correctly predict market demands and study different markets. It also recommends to increase cooperation with suppliers and customers to follow up on new developments in the market. And maintain a database on suppliers and competitors for the purpose of constantly analyzing their environment and information. The study also recommends the need to train workers with multiple skills and abilities that make them able to perform multiple tasks, and work on continuous change in the design of production processes.

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The Effect of Talent Management on Organizational Innovation of the Telecommunications Companies in Jordan

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Abstract This study aimed to identify the impact of talent management on Organizational Innovation. The study population consisted of 370 employees distributed over three companies representing the telecommunications sector in Jordan. An electronic

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_97

questionnaire was distributed via (Google Forms) and shared by talent managers at Jordanian telecommunications companies, and 257 responses were valid for statistical analysis. After conducting a statistical analysis, the study reached the presence of a statistically significant effect of talent management has a statistically significant effect on Organizational Innovation in Jordanian Telecommunications companies. The study recommended giving attention to talent management, as it represents the first driver of all work activities.

Keywords Talent management · Organizational innovation · Mobile communications companies · Jordan

1 Introduction

Talent management as one of human resources field seeks to build and develop the idea and concept of focus on talent culture as a major competitive advantage source, as companies that possess talented and distinguished work force can develop their organizational culture to be an attractive place to work, a source of employees' pride, build loyalty and trust between existing employees (Abuhashesh et al., 2021; Odeh et al., 2021). Talent is an organizational important issue, as organizations are competing to include distinguished talent in light of the supply of job seekers increase and talent in qualitative terms scarcity (Al-Lozi et al, 2017; Al-bawaia et al., 2022). The human element, talent, was one of the main organizational characteristics that influence innovative behaviors and capabilities in service-oriented organizations (Almaazmi et al., 2020; AlTaweel & Al-Hawary, 2021). These talents include all the acquired skills that employees display from all of their training experiences (Al Suwaidi et al., 2020; Nuseir et al., 2021). Talent management represents the energy that moves and pushes talents towards creative and distinguished work and increases organizational attractiveness. Organizations' adoption of talent management leads to building of employee's capabilities, and at the same time, effective performance that builds competitive advantage depends on the competence and capabilities of these individuals (Al-Hawary & Nusair, 2017; Al-Hawary & Al-Namlan, 2018; Mohammad et al., 2020). Organizations strive to excel constantly, and this requires them to continuously improve their capabilities to suit their client's needs and expectations (Al-Hawary & Abu-Laimon, 2013; Al-Hawary & Al-Smeran, 2017; Al-Hawary & Obiadat, 2021; Al-Hawary et al., 2013; Alolayyan et al., 2018; Alshurideh et al., 2017). This improvement requires skilled, distinguished, trained and talented human resources, in addition to the presence of specific strategies that help them complete their work, which indicates talent management strategies importance in high levels

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of achievement, which is positively reflected on the organizational innovation and its members in order to achieve high levels of strategic creativity in the short and long term (Alhalalmeh et al., 2020; Cappelli, 2008; Al-Hawary & Al-Syasneh, 2020; Al Kurdi et al., 2020a, 2020b; Alshurideh, 2022).

The researcher noted the discrepancy in telecommunications companies provided services quality and consequently the diversity processes involved in providing the service, and because the telecommunications sector targets all segments of Jordanian society, the circumstance must find human cadres with high flexibility capable of dealing with all the conditions created by the surrounding environment and finding the best ways to reach excellence at the level of service delivery and operations. In view of the fierce competition between Jordanian telecom networks, they strives to own what distinguishes them and makes it unique, whether it is a customer service that represents a superior response and meets the needs or a distinct process that achieves the customers value. Or strategies that are difficult for competitors to imitate. Therefore, we will start here to see the impact of talent management on the organizational innovation.

2 Literature Review and Hypotheses Development

2.1 Talent Management

The term "talent" has different definitions according to different fields of study. Nurhadi and zahro (2016) define a set of different definitions of "talent" such as mastery of abilities and skills, individual ideas to generate creative ideas, set of values, intrinsic endowment, and cognitive skills or enhanced competencies that allow employees to perform in an excellent manner. The term talent management is defined as the process of attracting, selecting, developing and retaining talent for the best employees in a strategic organizational position (Scullion & Collings, 2011). As Cunningham (2007) says that talent management typically means high performance and a resource that must be managed mainly according to performance levels, therefore talent individuals must be sought, appointed and rewarded differently, regardless of the special roles they play or even organization special needs.

As Bhatnagar (2007) points out that talent management is the priority for rapidly attracting organization attention across the world, talent management is primarily designed to improve individuals recruitment and development process in order to meet the current organizational needs as the various characteristics of talent management are recruitment and selection Supervision, performance management, career development, leadership development, planning alternatives, excellence and reward. talent management importance appears in what it achieves for the organization, as it is considered a source of business organizations excellence, and the organizations' practice of talent management processes from attracting, developing, motivating and sustaining talented employees helps in achieving the organization's current and future

goals, in addition to talent management importance appears in its ability to provide departments and sections needs of human resources who working responsibly, flexibly and quickly in decisions making. (Alameeri et al., 2020; AlShehhi et al., 2020; Grapragesem et al., 2014).

As indicated by Jones (2010) that talent management aims to build a culture that helps generate commitment and build the capabilities and competencies necessary to possess the integrated talent, using the distribution and development process that aligns with organizations objectives. Researchers have differed about talent management dimensions due to the multiplicity of views on this concept, as Stahl et al. (2007) sees that it includes talents recruitment, succession planning, training and talents development, and talent retention, while Collings and Mellahi (2009) indicates that it includes identifying vital jobs, develop and grow the talent pool, create a structure of diverse human resources, to measuring talent management Kumari and Bahuguna (2012) relied on several dimensions: identifying vital job positions, aggregating talent, attracting talent, managing talent performance, developing talent, disseminating talent, and retaining talent. Buthelezi (2010) identified several dimensions: Manpower planning, talent attraction and selection, career path management, performance management, talent development, reward and recognition.

As for this study, the study relied on a set of dimensions to measure talent management: talent attraction, talent education and development, talent training, talent performance management, and talent retention. Attracting talents: the process of identifying and selecting talent requires the use of multiple techniques to collect data on talented individuals, including the central assessment methodology, psychometric tests, talent data integration, and finally talent maps that represent the result of the talent identification and selection process (Al-Hawary, 2011; Egerova et al., 2013). Talent training: training refers to achieving the competency, information, and ability needed to carry out activities through training (Al-Hawary, 2015; Kum et al., 2014; Shamout et al., 2022; Alshurideh et al., 2022). It is evident in the literature that organizations that invests in talent training, talent development and continuous learning programs is more likely to attract and retain employees through its intent to eliminate employee turnover, it also has an economic and performance advantage from these employees. Talent education and development is the high potential individuals and future senior managers' development for what it wants from its senior leaders in the future, talent performance management (Al-Hawary et al., 2020; Alshamsi et al., 2020; Metabis & Al-Hawary, 2013). This step refers to performance measurement, that is, the process of planning, managing and evaluating employee's performance over time. This step is important in a talent management system for simple reason that management does not want to promote people whose current jobs are not performing effectively, in order to maintain credibility (Al-Hawary & Alajmi, 2017; Alkitbi et al., 2020). Finally, retaining talents by organizing an encouraging environment for talented people to present their suggestions through holding seminars, exchanging creative ideas and innovative skills, and forming development plans to support employee performance. It helps create a stronger working relationship between the employee and his manager that enhances loyalty and retention.

2.2 Organizational Innovation

Innovation refers to the ability to find new things that may be ideas, solutions, products or services, or useful ways and methods of work (Alameeri et al., 2021; AlTaweel & Al-Hawary, 2021). "Innovation is the ability to provide unique answers to posed problems and exploit opportunities." Organizational innovation becomes the main factor in the existence of the company in a competitive environment where the successful introduction of new products is the lifeblood of most organizations (Al-Hawary & Aldaihani, 2016; Tohidi & Jabbari, 2012). The importance of organizational innovation appears in that it helps the organization work well by improving coordination, internal control and the organizational structure (Alzoubi et al., 2022; Ghannajeh et al., 2015). It also leads to facilitating administrative processes that enable the organization to continue its work and find creative solutions to the problems it faces efficiently and effectively, and to bring positive changes in the institution's and its administrative processes, and helps it adapt and interact with all the surrounding environmental variables, improve its productivity, raise its performance levels and employees performance, and find discoveries, proposals and ideas for the development of new, innovative and creative systems, regulations, procedures and work methods, which results in the emergence of programs and services outside the main enterprise activities, improving the products and services quality provided to customers benefiting from the service, and increasing its financial input (Al-Nady et al., 2013; Allahow et al., 2018; Alzoubi et al., 2020). Organizational innovation is an integral part of the culture of any organization that seeks success, as it occupies the heart of its activities and operations (Al Naqbi et al., 2020; Al-Hawary & Alwan, 2016). "Innovation in organizations creates the appropriate climate that enables the organization to be able to develop new products to satisfy customers' needs in the market on the one hand, and the ability to achieve the growth goals sought by the organization on the other hand."

According to Walker (2008) organization innovations are innovations in structure, strategy and managerial processes. While Afuah (1998) classified organizational innovation into three categories: The first is technological, including products, services, and processes. The second is the market including product, price, place and promotion and the third is organizational and managerial including strategy, structure, systems and people. This research is based on the use of the following dimensions of organizational innovation, service innovation, which is new idea introduction that focus on services that provide new ways to provide benefit, new service concepts, or new service business models through continuous operational improvement (Enz, 2012).

Product innovation: introducing a new product, introducing new functions, improving performance, or adding new features to existing products; Consumers do not know it (Susman & Warren, 2006). Process innovation is new production methods introduction, management methods and techniques that can be used to improve production and management processes. And managerial innovation, which

is often specifically related to strategies, structure, policies, or people within the organization (Popadiuk & Choo, 2006). It is a set of clear and well-defined approaches and processes aimed at discovering and managing knowledge functions, in various types of operations, identifying new products or strategies, strengthening human resource management, and achieving a number of other goals to be achieved.

2.3 The Relationship Between Talent Management and Organizational Innovation

Many studies have emphasized the relationship of talent management and organizational innovation. Attracting talent is one of the important things that determine organizational performance, and thus attracting talent has a significant positive impact on organizational performance. Abou-moghli (2019) emphasized that innovation strategies contribute significantly to enhancing organizational competitive advantage. Talent management is a catalyst for organizational performance improvement because the process of innovation, retention and attraction is a significant influence on organizational effectiveness. Retention, participation, and attraction influence the innovation process and organizational effectiveness. The investment in talent management and development enriches the intellectual capital, which is a great balance of competitive advantage and organizational creativity (Abd El Rahman & Farghaly, 2019). Mohammed et al. (2018) confirmed with his study on talent management that there is great competition between organizations in modern technology area, which has led to an increase in knowledgeable employees in addition to huge changes in the market. Consequently, academic institutions have begun to rethink their procedures and policies to best attract, develop and retain these employees. Olaka determines the extent of the relationship between talent management and creativity, and the results of his study showed that there are positive relationships between the variables of talent management and the variables corresponding to creativity. The researcher adds that the proper identification, development, use and retention of talent is likely to translate into higher innovations in terms of services, processes, marketing and products and this will also lead to improved organizations performance and profitability. Based on the foregoing, study hypothesis can be formulated as follows.

There is a statistically significant effect of talent management on organizational innovation of Jordanian telecom companies.

3 Study Model

See Fig. 1.

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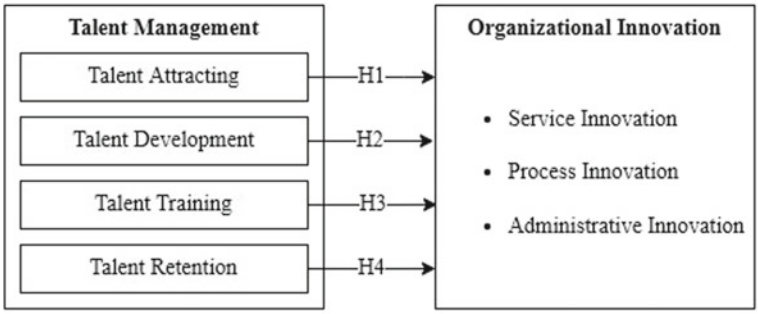

Fig. 1 Research model

4 Methodology

4.1 Population and Sample Selection

A qualitative method based on a questionnaire was used in this study for data collection and sample selection. The major aim of the study was to examine the impact of talent management on organizational innovation. Therefore, it focused on Jordan-based companies operating in the telecommunications sector. Data were primarily gathered through self-reported questionnaires creating by Google Forms which were distributed to a purposive sample of (370) HR managers via email. In total, (282) responses were received including (25) invalid to statistical analysis due to uncompleted or inaccurate. Hence, the final sample contained (257) responses suitable to analysis requirements that were formed a response rate of (69.4%), where it proved to be sufficient to the extent that was predictable and allowed for a presumption of data saturation (Sekaran & Bougie, 2016).

4.2 Measurement Instrument

A self-reported questionnaire that consists of two main sections along with a section regarding control variables was used as the measurement instrument. Control variables considered as categorical measures were composed of gender, age group, educational level, and experience. The two main sections were dealt with a five-point Likert scale (from 1 = strongly disagree to 5 = strongly agree). The first section contained (20) items to measure talent management based on Al-Lozi et al. (2018). These questions were distributed into dimensions as follows: five items dedicated for measuring talent attracting, five items dedicated for measuring talent development, five items dedicated for measuring talent training, and five items dedicated for measuring talent retention. Whereas the second section included (18) items developed to measure

organizational innovation according to what was pointed by Al-Hawary & Aldaihani (2016). This second-order construct was divided into three first-order constructs. Service innovation was measured by six items, process innovation was measured through six items, and administrative innovation was measured using six items.

5 Findings

5.1 Measurement Model Evaluation

This study was conducted structural equation modeling (SEM) to test hypotheses, which represents a contemporary statistical technique for testing and estimating the relationship between factors and variables (Al-Adamat et al., 2020; Al-Gasawneh & Al-Adamat, 2020; Wang & Rhemtulla, 2021). Accordingly, the reliability and validity of the constructs were tested using confirmatory factor analysis (CFA) through the statistical program AMOSv24. Table 1 summarizes the results of convergent and discriminant validity, as well the indicators of reliability.

Table 1 shows that the standard loading values for the individual items were within the domain (0.651–0.901), these values greater than the minimum retention of the elements based on their standard loads (Al-Lozi et al., 2018; Sung et al., 2019). Average variance extracted (AVE) is a summary indicator of the convergent validity of constructs that must be above 0.50 (Howard, 2018). The results indicate that the AVE values were greater than 0.50 for all constructs, thus the used measurement model has an appropriate convergent validity. Rimkeviciene et al. (2017) suggested the comparison approach as a way to deal with discriminant validity assessment in covariance-based SEM. This approach is based on comparing the values of maximum shared variance (MSV) with the values of AVE, as well as comparing the values of square root of AVE ($\sqrt{}$AVE) with the correlation between the rest of the structures. The results show that the values of MSV were smaller than the values of AVE, and that the values of $\sqrt{}$AVE were higher than the correlation values among the rest of the constructs. Therefore, the measurement model used is characterized by discriminative validity. The internal consistency measured through Cronbach's Alpha coefficient (α) and compound reliability by McDonald's Omega coefficient (ω) was conducted as indicators to evaluate measurement model. The results listed in Table 1 demonstrated that both values of Cronbach's Alpha coefficient and McDonald's Omega coefficient were greater than 0.70, which is the lowest limit for judging on measurement reliability (De Leeuw et al., 2019).

Table 1 Results of validity and reliability tests

Constructs	1	2	3	4	5	6	7
1. Talent attracting	**0.777**						
2. Talent development	0.517	**0.769**					
3. Talent training	0.497	0.471	**0.783**				
4. Talent retention	0.438	0.442	0.502	**0.754**			
5. Service innovation	0.628	0.588	0.556	0.567	**0.766**		
6. Process innovation	0.678	0.625	0.637	0.598	0.671	**0.779**	
7. Administrative innovation	0.597	0.567	0.697	0.684	0.662	0.604	**0.744**
VIF	1.763	2.357	1.746	2.156	–	–	–
Loadings range	0.681–0.881	0.705–0.835	0.651–0.901	0.693–0.827	0.683–0.864	0.662–0.897	0.655–0.825
AVE	0.604	0.591	0.614	0.569	0.586	0.607	0.554
MSV	0.502	0.472	0.513	0.520	0.483	0.516	0.409
Internal consistency	0.881	0.875	0.884	0.866	0.892	0.899	0.878
Composite reliability	0.883	0.878	0.887	0.868	0.894	0.902	0.881

Note Bold fonts in the table refer to the square root of AVE

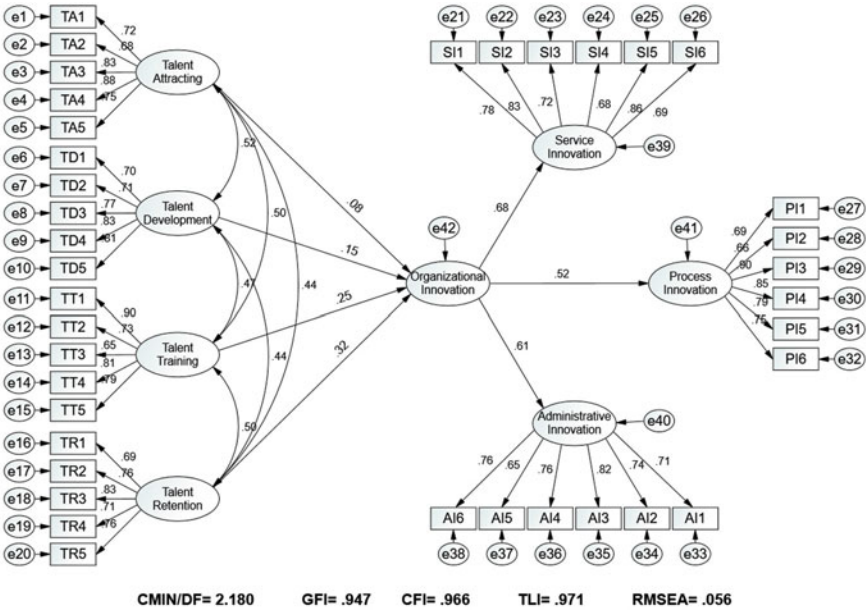

Fig. 2 SEM results of the talent management effect on organizational innovation

5.2 Structural Model

The structural model illustrated no multicollinearity issue among predictor constructs because variance inflation factor (VIF) values are below the threshold of 5, as shown in Table 1 (Hair et al., 2017). This result is supported by the values of model fit indices shown in Fig. 2.

The results in Fig. 2 indicated that the chi-square to degrees of freedom (CMIN/DF) was 2.180, which is <3 the upper limit of this indicator. The values of the goodness of fit index (GFI), the comparative fit index (CFI), and the Tucker-Lewis index (TLI) were upper than the minimum accepted threshold of 0.90. Moreover, the result of root mean square error of approximation (RMSEA) indicated to value 0.056, this value is a reasonable error of approximation because it is less than the higher limit of 0.08. Consequently, the structural model used in this study was recognized as a fit model for predicting the DEP and generalization of its result (Ahmad et al., 2016; Shi et al., 2019).To verify the results of testing the study hypotheses, structural equation modeling (SEM) was used, the results of which are listed in Table 2.

The results demonstrated in Table 2 show that all talent management dimensions had a positive impact relationship on organizational innovation except talent attracting ($\beta = 0.081$, $t = 1.302$, $p = 0.195$). However, the results indicated that the highest impact was for talent retention ($\beta = 0.316$, $t = 6.045$, $p = 0.000$), followed by talent training ($\beta = 0.248$, $t = 5.368$, $p = 0.000$), and finally the lowest impact was for talent development ($\beta = 0.148$, $t = 3.235$, $p = 0.040$).

Table 2 Hypothesis testing

Hypothesis	Relation	Standard Beta	*t* value	*p* value
H1	Talent Attracting → Organizational Innovation	0.081	1.302	0.195
H2	Talent Development → Organizational Innovation	0.148	3.235	0.040
H3	Talent Training → Organizational Innovation	0.248	5.368	0.000
H4	Talent Retention → Organizational Innovation	0.316	6.045	0.000

Note $*p < 0.05$, $**p < 0.01$, $***p < 0.001$

6 Discussion

It has been evident from the study results that the company under study is keen on developing, improving and training talents through its continuous endeavor to encourage talents to present ideas and proposals, involve them in educational workshops and conferences, and provide a distinctive training environment. Telecom companies seek to retain what they have of talent by providing material and moral incentives and opening doors for career development. study results also confirmed that company management concerned with talent management is not aware of the of attracting talent importance that they have not clear strategies for attracting employees and evaluate them carefully to discover and exploit their strengths. The results showed the interest of telecommunications companies in supporting talents to provide a high quality service that satisfies customers. This results agreed with the study of Emmy & Hillary, which showed that there is a significant positive impact of the variables (talent attraction and its dimensions are selection and polarization, employee promotion, job security) on job performance. And it appeared that Jordanian telecom companies are interested in supporting talents to present new ideas related to improving service delivery by automating procedures, modifying and improving their processes, and finding innovative ideas to reduce the operational cost of operations while raising their outputs. This result agreed with Al-Hiyasat study, where the study showed an impact of the talent management strategy (talent attraction, talent investment, talent development, talent development, talent retention) in achieving the competitive advantage. Study results showed that supporting, developing and retaining talent contributes greatly to innovation and creativity in presenting work methods, in addition to creating distinctive and renewable administrative policies. So that Jordanian telecommunications companies constantly seek to involve talented people in the decision-making process related to work goals. This result agreed with the study of Abou-Moghli (2019). The results showed an important and positive impact of the innovation process, retention and attraction on organizational effectiveness. In addition, the study found a positive and significant role in moderation of retention, engagement, and attraction in the innovation process

and organizational effectiveness. Talent management in Jordanian telecommunications companies pays attention to the human resource for innovation and creation of creative ideas to provide high quality services. Talent management role is enhanced by attracting, developing and retaining talent in finding innovative and unique ways to enhance its competitive strength.

7 Recommendations

Based on the results, the study recommends that Jordanian telecommunications companies adopt clear employment strategies to attract talented people internally or externally and place them in the right place to increase creativity and enrich companies with unique and distinctive ideas. Encouraging talented people who are able to think innovatively by providing practical suggestions for creating new services, improving new services, and a new process. Emphasis on the education and development of talents and their development to enhance their creativity, allocate a budget to develop the capabilities of the gifted, and involve the gifted in educational workshops or conferences dealing with enhancing the quality of services and operations provided. As well as following up on employees strengths and weaknesses to fill the knowledge gap at all levels and qualify them to participate in presenting distinctive and unique ideas.

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Running Head: Impact of Smart Buildings on Accounting and Management Control

Ala'a Yahya Ahmad, Nedal Fawzi Assad, and Muhammad Turki Alshurideh

Abstract This study investigates the impact of smart buildings on accounting and management controls. By analyzing the innovative building structures, this study will find out the accounting and management controls patterns and their solutions or help improve management control or reduce costs. Studying different articles for this study hardly find any relevant article or research paper on this study, but some documents are available on management and controls and intelligent buildings. So, the research gap of this study is that no investigation was done on this topic. As earlier, no research was done on this topic, so my analysis will be based on primary qualitative or exploratory research. Based on this, some previous papers will be analyzed and based on that information; thematic solutions will be provided.

1 Introduction

An intelligent building should provide its occupants and owners with a wide range of high-value features and benefits. However, after some time, expectations for a building shift while the structure itself is at risk of deterioration and degeneration. To ensure that intelligent buildings meet all their requirements throughout their lifecycle, careful attention to detail is required. In addition to thorough planning throughout the construction and execution phases, the building's operating term needs high-quality administration and upkeep. All the way through, the facilities manager is a

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_98

key actor. The contemporary building of the twenty-first century must show a high degree of adaptability and usefulness in addition to good architectural, technical, and environmental characteristics. Keeping an eye on all these features is essential. As a facilities manager, you may be responsible for installing and analyzing building monitoring systems. As the level of relevance of building optimization grows, so does the number of solutions available for improvement. As a result, the best chances of successful project implementation are found in the early stages of project planning. It is estimated that up to 80% of all operating expenses are established at this point, just before construction begins. At most, only around 20% of a building's operating expenditures may be modified throughout its life (while 80% of the overall costs are regularly attached to the operational phase). Although it is not common practice in many countries, the participation of facility managers in the early stages of building design should be the norm. As a result, existing buildings may be reconstructed or altered without compromising the integrity of the original design. When designing smart buildings, having a facility manager on board is essential. This means that the facility manager is tasked with representing the interests of both the investor (the future owner) and the building's future occupants. For example, suppose a facility manager assumes control of an already-completed construction project. In that case, they will have only a limited number of alternatives for improving the long-term cost-effectiveness of the building. For a facility manager devoted to their profession, such practices are difficult to bear. As a result of the inability of both the building owner and potential tenants to complete critical optimization efforts that affect operating expenses, this has happened in this instance. A significant deficiency in the building's use phase is that the concept of planned (preventive) maintenance has not yet been adequately extended. There is still a great deal of building and equipment maintenance done out of necessity rather than a genuine desire to address the root causes of any given manifestation or issue. As a result, both the frequency of repairs and maintenance costs have increased. Preventative maintenance may save you up to four times the cost of repairs if you don't undertake it. In addition, uncoordinated interventions in building management and necessary disturbances to the facility's functioning harm building users' well-being. In the context of smart buildings, this is an absolute no–no. Instead, facilities managers must work with other components (such as suppliers of innovative technologies) to mitigate such risks and prevent such eventualities.

2 Literature Review

2.1 Smart Building Policy

Building owners and users' needs are the core emphasis of "smart building," which may be defined in various ways. The primary focus is on how technology, services, and system solutions can be leveraged to meet these needs. Operational costs and

energy usage, the interior atmosphere, and the preservation of the building's technical condition and market value are all factors that must be taken into account to accomplish this. To suit the growing demands of both owners and users, subgroups of criteria must be established for each of these factors (Stamatescu et al., 2019). This implies that the building's inherent intelligence must be preserved by not changing its qualities through time but rather by improving its quality. All kinds of buildings, from residential to administrative to public, may benefit from this approach, which considers the unique purpose for which they were designed. Some of the demands made by owners and renters of intelligent buildings are compatible, while others are at odds. Owners prefer the following alternatives:

- minimizing acquisition costs.
- minimizing operating costs.
- minimizing energy costs.
- minimizing repair and reconstruction costs.
- maximizing the return on investment of the building.
- continuous conservation or increase in construction value (investment protection).
- optimizing the level of security of the building and its users.

It was evident from this review that the financial demands of buildings are of crucial importance. However, although the user owner's) interests are vital, the owner does not need to interfere with those interests.

- The flexibility of leased spaces.
- The quality of the indoor environment that contributes to achieving the desired comfort of use or to increasing work productivity.
- Maximizing security level.

Renting out the interior of a building to satisfy tenants' demands is a frequent practice for building owners. The owner's expenditures throughout the building's construction, existence, and operation should be monitored less for "minimization" and more for "optimization" in light of the three requirements of the building. While the facility is being utilized, the facility manager's role is to keep an eye on and safeguard the interests of all parties involved throughout the planning, projection, and final realization phases. Many vendors and suppliers often give particular technologies or even partial facets of the building's intelligence as part of its implementation or upkeep. However, whatever technology is utilized to administrate sub-groups or to manage the building's general operational management must run smoothly at all times. Therefore, certain technologies are allocated to sub-groups to satisfy the building's specific functional demands. For example:

- optimization of energy management.
- power system management, heating, ventilation, cooling, air conditioning, lighting, shading technology, external sources (weather forecasting, etc.).
- fire safety of buildings and users—fire safety system, ventilation, lighting, lifts, security system, power system control.

- user safety—security system, person entry system, indoor CCTV circuit, charges, lighting.

The BMS (Building Management System) platform is used to regulate all of the building's systems and offer real-time access to information to establish an integrated multi-operating structure. BMS keeps track of individual technologies and raises warnings when something out of the ordinary occurs while archiving any intermediate data. The operator has to be subservient to the facility management to respond to the data supplied (Gonçalves et al., 2020). Human variables like security and cleaning, in addition to the BMS platform's technologies, must be managed by facility managers to guarantee that the intelligent building works optimally for its owners and users. Starting with the design phase and continuing throughout the life of the building, BIM (Building Information Modeling/Management) should be an integral part of any innovative building project. Stanford University's Center for Integrated Facilities Engineering studied 32 BIM-based projects. The design and implementation duration were significantly reduced because of the contributing components' more effective data management and coordination. The reduction of collisions throughout the pre-implementation and implementation phases saves up to 40% off-budget and 10% of total expenses. For intelligent buildings, BIM's financial advantages are anticipated to be far more significant.

2.2 Facility Management in Smart Buildings

In today's building management paradigm, facility managers perform a wide variety of tasks (in the case of smart buildings). The administration of technological assets, coordination, and integrated management are often included in these packages (Dong et al., 2019). Therefore, FM may be divided into two primary divisions that do not have a clear border, based on the demands of the client and the needs of the company:

- **Space and Infrastructure**—so-called "hard services", i.e., space management, space utilization, management and optimization of the workplace, technical management of buildings, energy management, waste management, indoor and outdoor cleaning.
- **People and Organizations**—so-called "soft services", i.e., health, hygiene, safety and security, internal services (boarding, receptions, meeting rooms, secretarial services, etc.), ICT, internal logistics (archive services, internal mail, mail service, transport services, car service, etc.).

Management of facilities is defined by the International Facility Management Association (IFMA) as including operations management, design and architecture, and the arts and sciences. All systems in the building must be functional and efficient, as well as the structure's interior space must be efficiently used to guarantee the building's long-term survival (Dong et al., 2019).

To summaries, the ultimate purpose of facility management is to provide a high-quality interior environment while also maximizing the building's energy and resource efficiency. Whether it's a single structure, a collection of buildings, or a complex, the basics remain the same. Effective use of client assets is crucial to provide the most excellent possible support for the client's primary business activity. As part of the design team, a facilities manager should accept these requirements throughout the planning phases for a new building or restoration of an existing structure (Ostadijafari et al., 2019). However, smart buildings have higher operational system accountability than traditional buildings. This is why they provide more advantages than conventional buildings, such as more flexibility and usefulness, better interior environment quality, and higher operational efficiency. More than a hundred different technologies exist for these features, and their network is far more extensive and better connected than a conventional building's. But if technology fails, the structure's functionality and security are damaged, which is not necessarily fatal for a typical installation. Non-financial ramifications, such as a sullied reputation, might accompany the financial ones. Competent building facilities managers are not one person but rather a team of experts who are directly responsible to building owners or CEOs. There is a good chance that an intelligent building's management staff and its owners will have conflicting interests (Ostadijafari et al., 2019). This means that in addition to having an excellent professional name, the facility manager must also have the ability to speak up for the owner's interests and convey their own opinions.

2.3 Management Controls

The conceptual framework from Balaji et al. (2018) addresses the limitations of researching MCS in organizations. Additionally, the model provides an overview of the many controls, enabling complete investigation since each regime has its research path. This approach and attitude are increasingly used in research (Le et al., 2019). MCS is called "systems" because they are "systems for regulating team member behaviour, not systems simply utilized to obtain information for decision-making" (Balaji et al. 2018). This description does not include accounting systems used for decision support, which instead emphasizes behaviour. To be considered an MCS, cost accounting must also align team member behaviour. Managerial control may be used for various purposes, including but not limited to team member behaviour.

- **Cultural Controls**: Clans, crests, and customs are all part of the package. In an informal form of command and control, a company's culture influences the behaviour of its employees. As an informal control, it is challenging to study culture.
- **Planning**: Malmi and Brown do not consider long-term and action planning forms of control (2008). To control employees, you must have them actively participate in

the process. Individuals and organizations may use it to set goals and measure their progress. Budgeting and planning are inseparable and should be done together.

- **Cybernetic Controls**: Financial and non-financial metrics and a mix of both are all subject to the same level of scrutiny under this system. Measurements may be used to hold employees or organizations responsible for their performance. They are the foundation of MCS, and every firm relies on them. Cybernetic systems may be classed as either information systems or control systems, depending on their function.
- **Reward and Compensation**: They might be used as a control to inspire individuals or groups. Cybernetic controls, team member retention, and cultural control promotion are all part of this strategy. Business plans must be aligned with incentive schemes (Epstein et al., 2010).
- **Administrative Controls**: The organization's structure and design, governance, and rules and procedures are examples of administrative controls that may affect team member behaviour.

To ensure that changes are gradual, cultural controls have been placed at the top. Thus, they provide a framework for other authorities to operate in. Commands begin with planning, followed by measurement both during and after the process, and then possible reward and pay based on performance. There are three sequential controls. To exert authority, one must first establish a base. We can see a significant difference in the design and use of rules (Liew, 2019). MCS may now be studied in more depth, thanks to (Pašek & Sojková, 2018). Two primary topics may be found in this chapter. The setup of an MCS package will be the first step. Only a limited amount of research has been undertaken on the combined effects of these two factors. More evidence from MCS packages that have been deployed in practice is needed to understand better the most crucial systems and the contents of containers. This section focuses on the way systems interact with one another and how it influences their results. As part of the intelligent environment projects, environmental sustainability is a primary focus for each of the five control kinds. Therefore, an interview model is utilized to organize and analyze and summarise the results when conducting interviews (Wei et al., 2018). MCS package design is the most critical factor in determining what controls the city will apply in its MCS package. As a collective, respondents are more inclined to discuss controls than individual controls while answering the survey's questions.

> *One of the world's fastest-growing developing countries, the United Arab Emirates is no exception. One of the critical reasons for Dubai's rapid development is that the government started to plan for a smart city and gradually reflected on other emirates to promote Dubai's future city of Dubai.*

The need of constructing a long-term, ecologically friendly environment could not be overstated. Another motivation to create a green metropolis is the UAE's reputation as one of the world's most polluting countries. According to WWF's Living Planet Report 2014, the United Arab Emirates has the third-largest Ecological Footprint per capita in the world. That's why it's essential to the government that the physical environment, rules and public awareness all undergo significant changes (promoting

sustainability assessment methods, like LEED and ESTIDAMA, with stakeholders who are the decision-makers). The already-existing New York University Abu Dhabi campus was chosen for this study. The institution has 15.4 ha of property. Saadiyat Island in Abu Dhabi, the capital city of the United Arab Emirates, is home to the campus (Zou et al., 2018). On the property, you'll find classrooms, labs, and other resources for academic pursuits. In addition, students and lecturers can both find housing in the area. The building's structure is supposed to adapt to its surroundings, creating a setting that stimulates user-to-user contact. Because of its creative arrangement, the campus's many components, including the buildings themselves, interiors, and exteriors, form a unified whole. Students, faculty, staff, and administrators worked together to build a cooperative institution. This was reflected in the building's physical design and the school's academic offerings another noteworthy characteristic of the site in its landscape design that connects the many institutions on campus. For the ESTIDAMA sustainability accreditation, the NYUAD campus has been created to meet all of the requirements for its creation. Consequently, the case study will incorporate the interior and outside of campus characteristics to emphasize and analyze the components of the outside campus. The sustainable attributes of the contemporary building are divided into two categories:

- Outdoors features: Based on observed site visit.
- Interior Features: Based on a questionnaire survey with staff and students.
- Internal side streets are relatively narrow and shaded by the surrounding buildings.
- Use of local plants/palm trees and water channels that do not require excessive water while offering a soothing atmosphere during summertime and pleasant scenery for the people.
- The High Line is a must-see since it is the campus's most recognizable icon. The High Line is a system of bridges and stairways on the second level of every university campus that enables visitors to move between buildings freely. As seen in, a green canopy above the High Line works as a heat insulator. The advent of the High Line has made the university's campus more dynamic and exciting. In addition, students, instructors, and staff will be more likely to stroll between buildings if the walkway is well-designed. Because of the gardens and vistas from the tops of the buildings, students were more likely to walk between campuses. All across the school, solar panels have been installed on the roofs.

3 Thematic Results

3.1 Impact of Smart Buildings

To keep up with the growth of "smart buildings," facilities management must give way to real estate management. However, the smart (intelligent) building is a drawback because of the increasing reliance on embedded technology. In addition, the building's general operational performance and usability are harmed, putting the

productivity and health of its inhabitants in danger and raising operating costs. Owners are responsible for ensuring that their facilities are adequately maintained by appointing a top-notch facility manager (Gholamzadehmir et al., 2020). Technical and non-technical abilities are necessary for a facilities manager's work, but so too is the ability to analyze, interpret, and apply massive volumes of data to real-world circumstances. We should reasonably expect significant technical progress over the next 80 years, given the expected lifespan of buildings. The development of these systems requires continuous updates and integration with the building's central management system to meet the changing needs of the building's owners and users. There is a trade-off between the flexibility, investment protection, convenience of presenting traffic information, and freedom of decision-making that comes with both BMS platforms and building owners through facility managers. This is the fundamental difference between conventional approaches and individual attention to the demands of each structure and its residents. As a result, the procedure has been judged to be useless. They deliver superior customer service by integrating a variety of systems into a cohesive whole. An example of this is SEC and LS integration, a security and access control system. Providing smart access to multiple university departments via a single card is comparable to delivering smart cards and smart access to all students everywhere (library, classrooms, parking. etc.). The smart card may also be used by teaching staff to access classrooms in their department. Energy management and automation provider Schneider Electric cooperated with the University of West England in the United Kingdom to demonstrate a successful building integration. There will also be Schneider Electric's integrated security system on campus, in addition to new departments. Schneider Electric's Andover Continuum building management system and Juniper switch systems were used for both heating and lighting (Gholamzadehmir et al., 2020).

3.2 Management Controls

Planning for a city involves several steps, each of which takes a significant amount of time to accomplish. An essential consideration in the planning phase is the project's budget. The same holds when it comes to finding a business partner.

3.3 Cybernetic Controls

As required by the, the city keeps track of CO_2 emissions to keep tabs on the progress of the city's climate action plan. Nevertheless, this analysis falls short since it fails to account for all relevant factors. Moreover, the city can only have a limited impact on these traits since they are more than simply its boundaries. It is hoped that a dashboard would allow progress toward Liège 2025's strategic objectives to be tracked and

shown. Unfortunately, there was just a brief written account of the progress made at the time of the research, with no mention of the results or an overview of how well the objectives were met (Ramon-Jeronimo et al., 2019). Transversal strategic plan aims include the establishment of a dashboard, increased focus on a formal evaluation, and environmental effect measurement implementation in administration.—There must be a way to track progress toward goals and convey this information internally, as well as externally. According to individuals questioned, the city is working toward these goals and has a strong belief in the benefit of having more information available to residents. The alderman's goal is to have the scorecard in place by 2021. This dashboard may be used to keep tabs on and assess how far you are in achieving your objectives (Ramon-Jeronimo et al., 2019). If necessary, the project might be redirected during or after completion. Nevertheless, evaluating the long-term impact of many programmers is difficult since actions like spreading knowledge and teaching people are challenging to track. Objectivists may also benefit from the information. For example, they educate the public to make more informed decisions and get political support for their initiatives. In addition, real-time data management might help the city improve itself daily. Trash management already had a cleanliness dashboard in place, but it was marked as a work in progress. This dashboard displays data on things like resource use and rubbish collection by neighborhood. This information came from sensors and other sources (Neves et al., 2020). After never having attempted something like this, everyone in the city of Liège had to modify their mindsets. According to one responder, performance evaluations should improve performance, not detract from it. Keeping track of the city's finances is another critical cybernetic control. As a limited but vital resource, money is a primary cause of stress for the city's budget. To request a budget, there is a set procedure. The creation of an annual budget necessitates preparing one year in advance. To go forward, approval is required from the city council and the city financial supervisor (Neves et al., 2020). As a consequence, creating a budget is going to take some time. Nevertheless, the project must be finished on schedule to minimize financial losses at the end of the year. The transversal strategic plan states that enhancing budget management efficiency is a priority.

3.4 Reward and Compensation

For environmental activities in the Belgian city of Liège, there are no extra financial incentives or payments. However, other non-financial considerations were also listed to motivate people in the workplace. For example, workers' self-motivation was considered one of the essential variables in inspiring employees. However, the selection procedure did not include this as a consideration. Internally, the city sought to make its employees' jobs meaningful and express that it was improving people's lives due to this initiative. For this reason, employees are also trained and made aware of the company's impact on sustainability. Motivating and winning support for projects

may be achieved in part via team member engagement. It has been established that reducing the workload negatively impacts team members well-being, which is critical for a motivated workforce.

3.5 Administrative Controls

This section explains the major essential components of the city's organizational structure without going into depth. The political body comprises the mayor, older persons, and cabinet members. In contrast, the administrative body includes the remainder of the city council members and their staff. As a link between the people and the government, the elected body acts as a conduit for the people's will. For the most part, the tasks of these politicians fall outside the purview of other governments. It is the responsibility of the administration to implement the government's policies and provide critical services to the people. Organizations like these have boards of directors, managers for each area of responsibility and regional heads for each sector or neighborhood. Between the two entities, the alderman and his cabinet serve as a vital point of contact, monitoring the progress of many projects and objectives (Parker & Chung, 2018). Officials from both parties meet regularly to examine the progress of environmental programmes and see whether they are accomplishing their aims. The alderman claims that the two organizations work together in harmony. There is an ecological department. However, it must coordinate with every other municipal division. Managing data is a vital IT department responsibility, for example, in intelligent environment efforts like the Internet of Things. Different departments may call upon the environmental expert. When working with others or making purchases, the government must use public procurement. This method entails drawing up the project's specs, issuing an RFP, and comparing at least three offers. It's not only the project's budget that expands inexorably; the legal procedure that governs it does, too. For example, environmental issues may be considered when the city decides, and the transversal strategic plan have the reform of public procurement as a goal. Include ethical, social, and environmental clauses in contracts is the goal of this project as previously said, budgets play a crucial role in this strategy.

3.6 Cultural Controls

Our conversation focused on culture and environmental sustainability since culture spans various themes. They believe that a plethora of little gestures may have a significant impact. Various sectors and generations need different strategies to promote interdisciplinarity but creating a feeling of togetherness is necessary. It is possible to make individuals feel more responsible for their behaviour by informing them of the environmental repercussions. Also, it attempts to emphasize the need of including all essential stakeholders. The city uses eco-teams as role models for its personnel.

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There is an intranet, a letter called "info perse," and a quarterly journal sent internally in addition to the intranet. You may use these methods to get the word out about new projects or other departments.

3.7 Accounting

Some of the demands made by owners and renters of intelligent buildings are compatible, while others are at odds. As a general rule, it's pretty rare for owners to wish to lower their out-of-pocket expenditures in these four areas: acquiring the building at the lowest price, operating it at its most efficient level, and minimizing the amount of money they have to spend on repairs and rebuilds. Financial demands on structures are essential in this case. However, even though the user owner's interests are vital, the owner does not need to interfere with those interests. improving production, maximizing safety, and providing more adaptability in leased facilities are all examples of a company's "internal environment quality (Haseeb et al., 2019)."

4 Conclusion

To keep up with the growth of "smart buildings," facilities management must give way to real estate management. However, the smart (intelligent) building is a drawback because of the increasing reliance on embedded technology. In addition, the building's general operational performance and usability are harmed, putting the productivity and health of its inhabitants in danger and raising operating costs. Owners are responsible for ensuring that their facilities are adequately maintained by appointing a top-notch facility manager. Technical and non-technical abilities are necessary for a facilities manager's work, but so too is the ability to analyze, interpret, and apply massive volumes of data to real-world circumstances. We should reasonably expect significant technical progress over the next 80 years, given the expected lifespan of buildings. The development of these systems requires continuous updates and integration with the building's central management system to meet the changing needs of the building's owners and users. There is a trade-off between the flexibility, investment protection, and convenience of presenting traffic information, as well as the freedom of decision-making that comes with both BMS platforms and building owners through facility managers. This is the fundamental difference between conventional approaches and individual attention to the demands of each structure and its residents. As a result, the procedure has been judged to be useless.

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Predictive and Prescriptive Analytics Tools, How to Add Value to Knowledge-Based Economy: Dubai Case Study

Mounir El Khatib, Moza Abdalla Al Shamsi, Khalid Al Buraimi, Fatima Al Mansouri, Haitham M. Alzoubi, and Muhammad Alshurideh

Abstract Innovation and technology continue to be the driving force of growing economies. The need for constant change and improvement is driven by competing economies fueled by a more educated workforce and backed by proper governance structures. Dubai which has earned immense wealth in the petroleum industry is now venturing into these industries. Smart Dubai was open in 2000 as a smart city solution as an innovative initiative, large scale project for collaboration of private and public sector. These initiatives of Dubai Pulse which involves all stakeholders and entrepreneurs in accessing and sharing of data. It is having been touted for its analytical services. It will be instrumental to the future of uncovering Dubai from the veil of oil money. Dubai banks on technology and innovation particularly predictive and prescriptive analysis. The research study was conducted with the goals of analyzing the usage of both predictive and perspective analysis in the knowledge-based economy. The study also hopes to understand the value created through the use of predictive and perspective analysis in Smart Dubai and DEWA. The study raises conclusions on why the smart city project should be considered a success. Furthermore, there are areas that have been attributed to this success. The information was primarily collected through an interview with employees who heads the

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_99

data analytics department at Smart Dubai and employees in the middle management level at DEWA. The feedback from the interviews were elaborate and thorough to the research being gathered. The interview was divided into three concerning knowledge-based economy, use of analytical tools and Dubai Pulse Initiative. The use of the interview arises from the fact that the subject of study needed to be informed by firsthand knowledge. However, this primary source was complemented by other secondary sources. The data from Smart Dubai and DEWA were analyzed to determine the opportunities that the use of the analytical tools will have along with the challenges and benchmarking with global successful cases. Then the recommendations part provides similar governments with the roadmap of how to implement the analytical tools and overcome the challenges.

Keywords Predictive · Prescriptive · Analytics · Knowledge based economy · Smart Dubai · UAE

1 Introduction

UAE desires to maintain a diversified economy with "The Abu Dhabi Economic Vision 2030" and it was launched in 2009 (Ahmed & Alfaki, 2013). It shows that the UAE moves towards knowledge-based economy (Alshurideh et al., 2020a, 2020b; Aswad et al., 2011; Nuseir et al., 2021a, 2021b). Accordingly, the Government of the UAE aims to build a knowledge-based economy with sustainability that shall include process, product and distribution technology with the need for UAE economy diversification while overcoming any challenges or conflicts and acquiring all opportunities available during a knowledge-based economy transformation (Aburayya et al., 2020a, 2020b; AlMehrzi et al., 2020; Mina, 2014). There shall be need for the use of the analytics tools to ensure that a knowledge-based economy adds value to the economy of the UAE and that will be done in this study (Al-Maroof et al., 2021; Leo et al., 2021; Mehrez et al., 2021).

In this research study, literature review will be presented across two perspectives, the first one is the knowledge-based economy, then the analytical tools definition and how it can add value to the economy. Secondly, the research methodology and the data analysis will be presented based on the data gathering and analysis. The analyzed data then will be compared to the literature to identify gaps and opportunities of improvement. By the end of this research, we will conclude and make recommendations. The main objective of this assignment to analyze the usage of both perspective and predictive analysis tools and determine how it adds value to the UAE's knowledge-based economy. In order to meet this research objective, the research questions are the following:

1. How can the usage of perspective analysis tools and value to knowledge-based economy in Dubai?
2. How can the usage of predictive analysis tools add value to knowledge-based economy in Dubai?

2 Brief About the Organizations

2.1 Smart Dubai

Smart Dubai was first established in the year of 2000 but back then it was known as Dubai E-Government till 2013 when H.H Sheikh Mohammed Bin Rashid Al Maktoum changed its name to Dubai Smart government department. The vision of smart Dubai is aligned with the vision of H.H Sheikh Mohammed bin Rashid Al Maktoum to make Dubai the happiest city on earth and since then Smart Dubai has been pioneering smart city solutions and has been focused on transforming and empowering Dubai through disruptive innovative initiatives, large scale projects by collaborating with the public and private sector, leading technological projects and many more (Ahmad Aburayya et al., 2020a, 2020b; Taryam et al., 2020; Al Shebli et al., 2021; AlSuwaidi et al., 2021; Digital Dubai, 2022b).

To name a few, Smart Dubai had several initiatives that made quite an impression across the region and globally.

- Dubai Paperless initiative targeted towards the environmental aspect to preserve the environment by making Dubai a fully paperless government where the governmental department will no longer issue or ask for any papers or printed documents to be handed over across all operations (Digital Dubai, 2022d).
- Artificial Intelligence Ethical toolkit that includes the guidelines, self-assessment tool for developers, ethical considerations and common agreements. This initiative is targeted toward government entities, private sector, and individuals (Digital Dubai, 2022a).
- Dubai Blockchain Strategy project, which is a joint initiative between Smart Dubai and the Dubai Future Foundation that will lead the introduction of the blockchain technology to Dubai that is expected to "unlock 5.5 billion dirhams in savings annually in document processing alone" according to smart Dubai official website (Digital Dubai, 2022c).

This report will highlight a particular initiative called Dubai Pulse, this platform is designed to provide all the stakeholders including government entities, private sector, and entrepreneurs to access one location of shared open data. This initiative includes a core analytical services as well as big data services that can be used by various entities to enhance the living conditions and the economy in the UAE by promoting the vision of making Dubai the smartest and happiest city on earth (DubaiPulse, 2022).

2.2 Dubai Water and Electricity Department

Dewa was first established in 1992 as a result of the merge of Dubai Electricity Company and Dubai Water Department. DEWA provides its services to about

882,000 customers across Emirate of Dubai as the solo provider of electricity and water. DEWA has maintained a high customer happiness rate at a remarkably 95% in 2018 (Government of Dubai, 2022). DEWA strategy consists of five main pillars infrastructure, legislation, funding, building capacities and skills, and having an environmentally friendly energy mix. These pillars were supported of many innovative initiatives to transform Dubai to be the smartest city in the world (Government of Dubai, 2022).

3 Literature Review

3.1 Predictive and Prescriptive Analytics Tools

Predictive analytics are tools that are used to predict the future events through multiple techniques like data mining, statistics, modeling, machine learning and artificial intelligence. Those tools can help analyze the current data available at the organization's databases to come up with certain conclusions that will assist the management into making decisions based on knowledge rather than speculations (Abid et al., 2020; Alnazer et al., 2017; Alshurideh et al., 2020a, 2020b; Alzoubi & Ahmed, 2019; Mehmood et al., 2019). According to Gartner official website, predictive analysis "is a form of advanced analytics which examines data or content to answer the question "What is going to happen?" or more precisely, "What is likely to happen?", and is characterized by techniques such as regression analysis, forecasting, multivariate statistics, pattern matching, predictive modeling, and forecasting" (Gartner, 2022).

Moreover, prescriptive analytics are tools that helps the organizations to anticipate what will happen with the reason and the timing of the events in order to reduce future risks and make better decisions. According to Gartner official website "Prescriptive Analytics is a form of advanced analytics which examines data or content to answer the question "What should be done?" or "What can we do to make it happen?", and is characterized by techniques such as graph analysis, simulation, complex event processing, neural networks, recommendation engines, heuristics, and machine learning" (Gartner, 2022).

Prescriptive tools can be done by following two approaches, the first approach is by using the optimization model. This model chooses the best alternative or decision by running through a maximum objective function (Alzoubi & Yanamandra, 2020; Alzoubi et al., 2020a, 2020b; Joghee et al., 2020). This model is done through an analytical coded model using a software with many constraints to optimize the planning, scheduling, assigning limited resources to minimize the cost. For example, deciding on the best route for oil transporting vehicles from the depo to the petrol station, the model will be based on many constraints like vehicle size, petrol type, destination, distance, driver and traffic expected. The second approach is by using the rules model. This model uses the inputs, judgment and business rules to assign the best action. For example, providing customers with certain treatments or offers (Al Batayneh et al., 2021; Kart, 2015; Odeh et al., 2021).

3.2 The Value Added from the Use of the Analytics Tools

CIOs consider Data analytics as a "game changing" tools where it can unleash so many opportunities in fraud detection, analysis on transactional data, decision making process, reduce uncertainty and eliminate risk. The analytics tools vary in the process of decision making and the input they provide. As shown in the graph below the different analytics tools leads to better decision making with minimizing the human input (Fig. 3).

The use if the analytics tools can aid in the different layers of decision making, starting from the strategic, tactical, and operational level. Strategic decision happen less frequently but often has a wide range of impact, for example, building of a new school, a construction of a bridge, a drilling of oil location. These decisions often have a great amount of uncertainty, hence the application of the analytical tools specially the perspective tools can reduce the uncertainty and lead the government to make better decisions that will affect the citizens and the overall economy (Alshurideh, 2022; Hamadneh et al., 2021a, 2021b; Kart, 2015).

Another level of decisions is the tactical layer, these decisions often happen more frequently like on a daily, monthly, quarterly, or annual basis. The use of the analytical tools can lead the government to allocate the resources and the time properly therefore reducing cost and risk. An example of an approach of application is capital planning to allocate resources across tasks (Alaali et al., 2021; Alkalha et al., 2012; Kart, 2015).

The last level of decision is related to the day to day operations and translate the tactical decisions to actionable tasks. These decisions often carry less risk and the analytical tools can be of less impact here.

3.3 Combining of Predictive and Prescriptive Tools

To enable organizations to make optimum decisions, they must be quick, accurate in assisting complicated and time sensitive matters. Although making accurate predictions through the use of the predictive tools is essential but to truly add value the organizations must go even further by making decisions that can affect the predicted outcome through analyzing the likelihoods of a certain solution by the use of the prescriptive tools (Hasan et al., 2022; Herschel & Idoine, 2016).

Bringing together forecasts (predictive) with optimizations (prescriptive) lets an organization explore how changes to different variables are likely to change the outcomes or alter the relative trade-offs. It gets to the heart of the task of adding business value, of proactively making decisions that drive action and influence the future course of an organization.

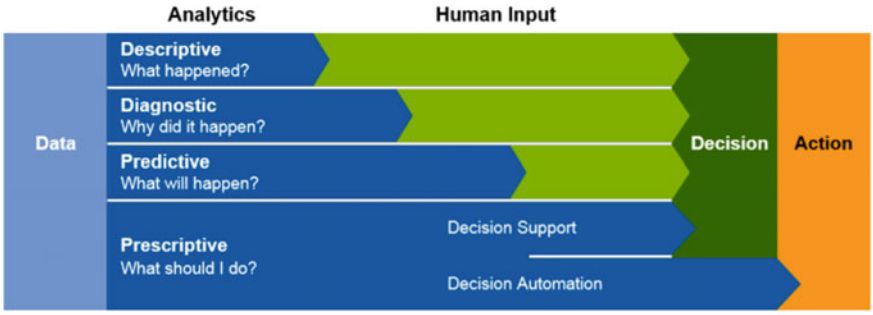

Fig. 1 Analytics capabilities

3.4 Knowledge Based Economy

According to Ahmed and Alfaki (2013), a knowledge-based economy is wider than the new economy or high technology and they are much related to the internet that is used often in the information society. The foundation of a knowledge-based economy is to create, disseminate and use knowledge and knowledge assets are given more importance than labor and capital assets (Al-Maroof et al., 2021; AlMehrzi et al., 2020; Shannak et al., 2012). Therefore, the societal and economic activities reach a very high level through sophistication and quantity of knowledge (Alzoubi et al., 2021a; Svoboda et al., 2021). Parcero and Ryan (2017) illustrates and explains the four pillars of a knowledge-based economy (see Fig. 1). It consists of four pillars and they are communication and information technology, innovation, education, and economy and regime (Alshurideh et al., 2019a, 2019b; Ashal et al., 2021; Awadhi et al., 2021).

The concept of a knowledge-based economy is used so an economy in the country can be described (Ahmed & Alfaki, 2013; Al-Jarrah et al., 2012; Alshurideh, Al Kurdi, et al., 2019a, 2019b). Dahlman and Utz (2005) states a knowledge-based economy is successful when there is link between industrial and science technology. The empowerment comes from increased lifelong and education learning with higher investments in software and research and development.

3.5 Knowledge Based Economy in UAE

According to Alfaki (2014), the UAE achieves good success in knowledge utilization due to technological infrastructure availability so they are moving towards knowledge-based economy. One of the strategic goals of the UAE is to expand in the non-oil sector with diversification strategy so competition with emerging markets can be made possible. In addition, the UAE federal strategy of 2011–2013 and UAE vision of 2021 and advocates in the increase of investments in research and development, science and technology so the economy of the UAE can be based on knowledge

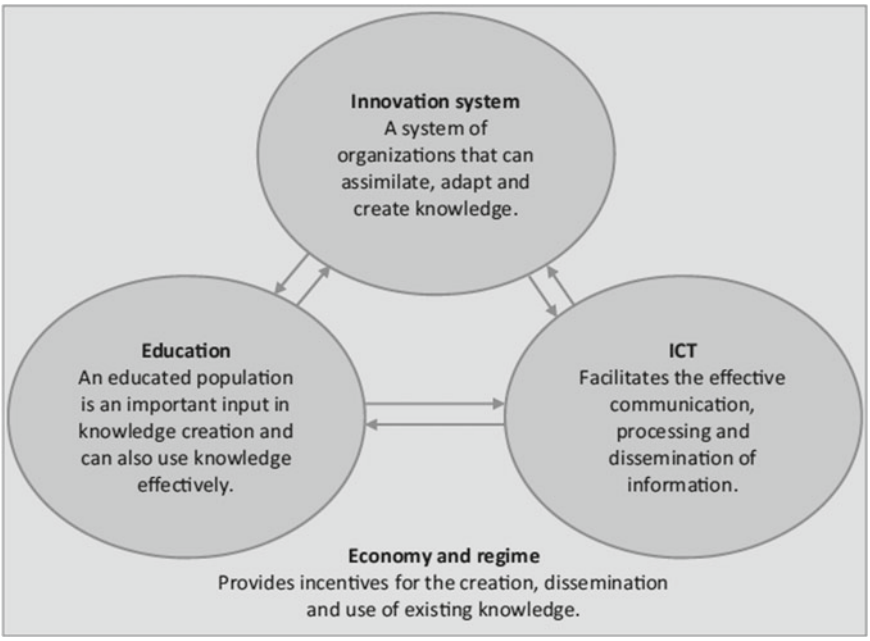

Fig. 2 The four pillars of a knowledge economy (Parcero & Ryan, 2017)

(Akhtar et al., 2021; Al Ali, 2021; Alzoubi, 2021a; Eli, 2021; Kashif et al., 2021). Figure 2 illustrates the performance of the UAE when comparing with Muslim countries as given by World Bank's KEI 2012 cited in Alfaki (2014). The performance of the UAE varies **with** other Muslim countries and the progress is quite impressive ranking 42nd, score 6.94 and the change is +6. In the UAE, there is good progress of a knowledge-based economy's implementation along with innovation, quality of infrastructure and macro-economic environment (Ahmed & Alfaki, 2013).

Alfaki (2014) finds that the UAE experienced major improvement in the ICT sector and ranks top when it comes to good performance in organizational innovation systems and ICT components of knowledge as given in Figs. 3 and 4. It shows a careful investigation of the four pillars such as ICT, innovation, education, and economic incentive (Fig. 5).

4 Research Methodology

The research methodology of this report was done through two methods, the first one used to gather the primary information was a qualitative method done thorough conducting a semi structured interview, this interview was done with an employee working at Smart Dubai and is expert in the data analysis field. Hamzeh Hamaraneh

Country	KEI	Rank	Change[a]
Sweden	9.43	1	–
Economies with large improvements in KEI rankings since 2000			
United Arab Emirates	6.94	42	+6
Oman	6.14	47	+18
Saudi Arabia	5.96	50	+26
Tunisia	4.56	80	+9
Iran	3.91	94	+1
Algeria	3.79	96	+14
Pakistan	2.45	117	+5
Nigeria	2.2	119	+5
Yemen	1.92	122	+6
Sudan	1.48	138	+1
Economies with decreases in KEI rankings since 2000			
Bahrain	6.9	43	−2
Malaysia	6.1	48	−3
Qatar	5.84	54	−5
Kuwait	5.33	64	−18
Turkey	5.16	69	−7
Jordan	4.95	75	−18
Lebanon	4.56	81	−13
Egypt	3.78	97	−9
Morocco	3.61	102	−10
Syria	2.77	112	−1
Bangladesh	1.49	137	−3
Myanmar	0.96	145	−8

Fig. 3 Muslim countries KEIs (Alfaki, 2014)

Index	UAE	Qatar	Bahrain	Kuwait	Oman	KSA	Korea	Singapore
KEI	6.73	6.73	6.04	5.85	5.36	5.31	7.82	8.44
KI	6.72	6.63	5.80	5.63	4.77	5.10	8.43	8.03
Economic incentive and institutional regime	6.75	7.05	6.75	6.50	7.15	5.94	6.00	9.68
Education	4.90	5.37	5.82	4.93	4.47	4.89	8.09	5.29
Innovation	6.69	6.45	4.29	4.98	4.94	3.97	8.60	9.58
ICT	8.59	8.06	7.30	6.96	4.90	6.43	8.60	9.22

Fig. 4 KEI, KI and the four pillar (UAE vs. Other countries) (Alfaki, 2014)

who the Head of Data Analytics has provided a thorough insight into the data analytics field at Smart Dubai, the interview questions were divided across three perspectives including knowledge-based economy, the use of the analytical tools, and Dubai pulse initiative.

The second method was to gather the secondary information of this report, though finding relevant publications, journals, and books from reliable sources like the University library, electronic databases like SSCI or EBSCO, recognized periodical journals and the organization main website.

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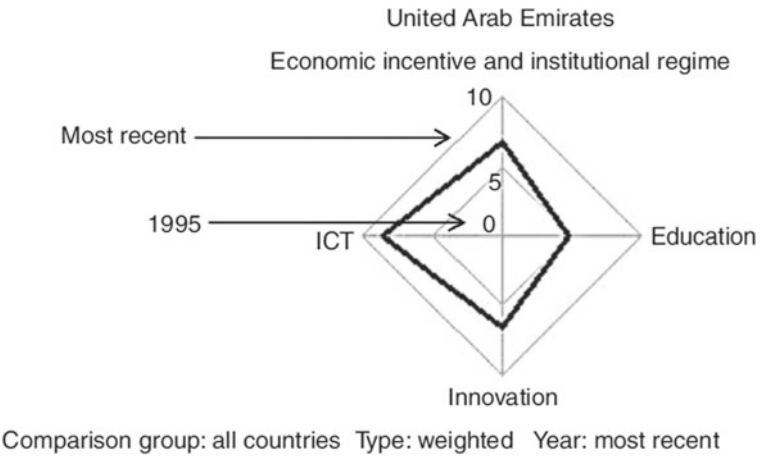

Fig. 5 KEI of the four pillars (UAE) (Alfaki, 2014)

5 Data Analysis

5.1 Smart Dubai Data Analysis

The following analysis points were concluded after a thorough analysis on the interview results and the related resources found:

1. Smart Dubai is supporting the knowledge-based economy through empowering the government entities with the technological tools and the reliable infrastructure of data sharing, storage, processing, and visualization. Which enables the government entities to make better and knowledge-based decisions in order to server the society better.
2. Smart Dubai is focused on building a collaboration between the public and the private sector to achieve several targets like smart transportation, smart society, smart economy, smart governance, and smart environment.
3. Smart Dubai has released the data law in 2015 "Law No. (26) Of 2015 on the Organization of Dubai Data Publication and Sharing" (Dubai Data, 2022), which makes Dubai the first city globally to release a Law to state the guidelines of the sharing of data between government entities and the open data available for the public.
4. The Dubai Data initiative will benefit the city by "increasing efficiencies in spending, job creation and innovation investment enhancement through creating new products and services and raise the level of citizen engagement. These benefits promotes government transparency and the ultimate happiness of Dubai residents and citizens" (DubaiPulse, 2018).
5. The main challenge that Smart Dubai is facing with building a knowledge-based economy, is the culture, people relay on printed papers and the usual routine

to perform tasks. Providing these tools that can replace people jobs are often frightened as mentioned by Hamarneh.

6. Smart Dubai vision is to make Dubai the happiest Dubai worldwide, although it meet seem simple but it is rather a large scope and challenging vision as stated by Hamarneh.
7. The Artificial Intelligence initiative by Smart Dubai that is considered as a predictive analysis project, which is used by Smart Dubai. According to Hamarneh, this tool can be used in so many use cases like:
    a. An AI service that will match children to school, so it will make it easier for parents to choose the right school to their children. Which reduces the burden that this task will have on any parents
    b. Another AI application is at Dubai Customs where thousands of containers are arriving to the port every day. AI will help them into deciding what to inspect and why and when by analyzing the Volume, history and country the container came from.
8. The AI can be of a great use in reducing or automating the repetitive tasks, like validating customer papers or inserting of forms information or detecting certain trends that will enable the government entity to perform better (Alzoubi et al., 2022; Hamadneh et al., 2021a, 2021b; Hanaysha et al., 2021a, 2021b; Lee et al., 2022a, 2022b).
9. Smart Dubai does not apply the prescriptive analysis tools, although that Hamarneh has mentioned that applying these tools can be of a great benefit to the government into making better decisions that will lower the cost, expect the demand through supply and demand mathematical modules (AlHamad et al., 2022; Ali et al., 2022; Alshurideh et al., 2022; Lee et al., 2022a, 2022b).
10. Dubai pulse is an initiative provided to all the stakeholders to make different analytical tools by the different data sets available for the use of the public that are regulated through Dubai data law. Many government entities are participating in this platform like Dubai Customs, Dubai Municipality, Dubai Silicon oasis Authority, Department of Dubai Economic Development, RTA, Dubai Health Authority and many other departments.
11. Dubai Pulse provides different data views like city flow, property land distribution, people flow, and property buildings distribution. These data views are available to provide the stakeholders with insights through interactive displays to enhance the stakeholder's decision-making process and create business value. Therefore, building a better and a knowledge-based economy (DubaiPulse, 2022).

5.2 DEWA Data Analysis

The following analysis points were concluded after a thorough analysis on the interview results and the related resources found:

1. DEWA is focused in making Dubai the smartest city on earth, and that can be accomplished through using the latest technologies and innovations to increase the happiness metric of Dubai citizens.
2. DEWA has adopted many initiatives to increase the reliance on Data in the decision-making process inclusive of the descriptive, predictive and prescriptive tools.
3. DEWA has adopted General Electric's industry wide Internet of Things platform, this platform enables the connection between machines, data, and people.
4. This platform will enable data to be collected and analyzed in real time to enhance the speed and efficiency of its operations.
5. This platform is designed to embed certain applications like built in Artificial intelligence to predict the assets lifecycle and prevent future malfunctions by using a continuous asset monitoring service to pre-identify and analyze root causes (AlShamsi et al., 2021; Holland, 2018; Nuseir et al., 2021a, 2021b; Yousuf et al., 2021).
6. DEWA currently uses dashboards to support the decision making process by the use of descriptive analytics.
7. The initiation of the GE platform will provide DEWA with many abilities to enhance their utilization of equipment's, better services to customers, attracting more beneficial opportunities and lowering cost.

6 Discussions

6.1 Comparison of Dubai Experience with the Analytical Tools' Literature

Smart Dubai is a unique example of high-level quality system that strive towards making Dubai the happiest city on earth. Smart Dubai has been adopting many projects that enhances the life of people and support the economy of the UAE. One of the main projects that Smart Dubai has initiated is the Dubai pulse project which is a platform to gather different data and visualize it in data views (Alsharari, 2021; Aziz & Aftab, 2021; Mehmood, 2021; Miller, 2021). Although that this project is roughly considered as a descriptive tool of data analytics rather than the prescriptive and predictive analytics. But it can assist in the decision-making process of the various stakeholders. Another project is the Artificial intelligence and machine learning project, which is a form of the predictive analytics tools, this project aims to eliminate any repetitive tasks and optimize the resources in order to provide better services to the citizens.

It is shown in the literature, that the use of the analytical tools can aid in the decision-making process on different managerial levels, hence establishing better services to the citizens and building a knowledge-based economy (Cruz, 2021; Khan, 2021; Lee & Ahmed, 2021; Mondol, 2021; Radwan & Farouk, 2021). Smart Dubai,

in this matter lacks the proper use of the analytical tools where it can be considered still seen as at the earliest stages of building a data driven added value projects, Smart Dubai has successfully established a collaborative data platform but still needs to establish projects that will have the different forms of the analytical tools like regression analysis, predictive modeling, pattern matching, data mining and machine learning.

6.2 Opportunities for Adding Value

Predictive analytics can provide the following opportunities to add value:

- Predictions: this analytical feature can predict the probability of a specific outcome (Idoine & Brethenoux, 2018). For example, possible repetitive congestion in any of the country main roads by predicting the outcome the government can make a diversion in the roads or build a new bridge that will aid in eliminating this congestion and keep the smoothness of the transportation. Another example of the prediction feature of the analytical tool is the maintenance scheduling of the government buildings or any public areas, this tool can predict the maintenance schedule of the area instead of having a problem reported and then responding based on it.
- Forecasting: the predicting of a series of outcomes over time (Idoine & Brethenoux, 2018).This feature can forecast a certain event in the future. Like the expected tourists in a certain season.
- Simulation: predicting multiple outcomes and highlighting uncertainties (Idoine & Brethenoux, 2018).

Prescriptive analytics can provide the following opportunities to add value:

- Rules: predefined framework for choosing between alternatives (Idoine & Brethenoux, 2018), for example, calculating the best way in performing an action or building an optimization model to ensure the optimization of the resources across the government. Also, it can aid in reducing any unnecessary costs and risks.
- Optimization: outcome-driven, constraint-based evaluation of an interdependent set of options (Fig. 6).

Moreover, the tools can increase the speed of the planning analysis, decisions that took weeks to be decided can be done within hours. Improved executive insights, more projects and opportunities can be exploited by the use of the analytical tools therefore creating and adding more value to the economy and the citizens (Ali et al., 2021; Alzoubi, 2021b; Alzoubi et al., 2021b; Farouk, 2021; Guergov & Radwan, 2021; Obaid, 2021).

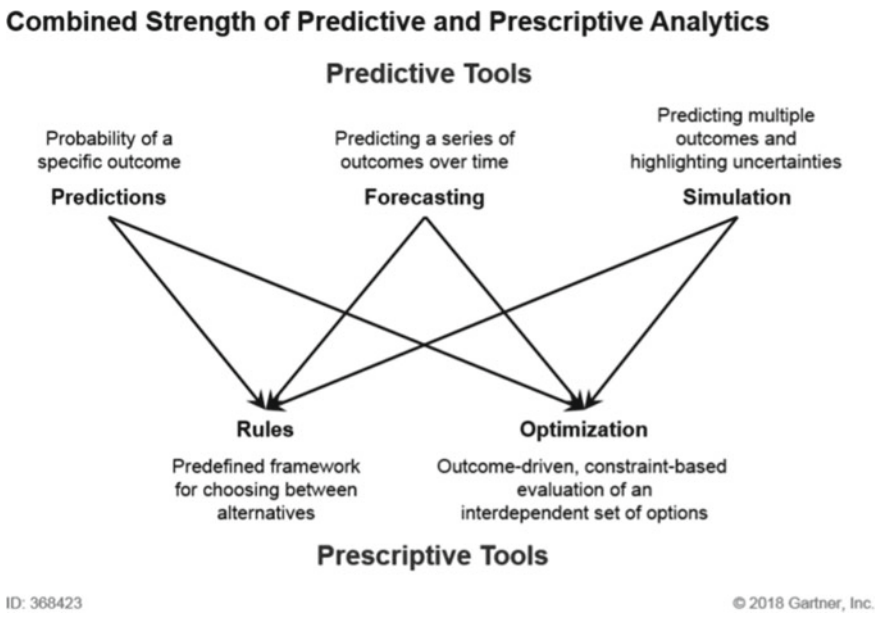

Fig. 6 Combine predictive and prescriptive analytics to exploit their respective strengths (Idoine & Brethenoux, 2018)

6.3 Challenges

The implementation of the tools in the government can encounter many challenges, the challenges can vary between infrastructure challenges to technological compatibility challenges. A few are mentioned below:

- Successful implementation of the tools comes from more than purchasing and deploying the software of the analytics, it also require the engagement of the right people, processes to leverage, implement, maintain, and govern the models and tools (Idoine & Brethenoux, 2018).
- Government data is scattered across many departments making the collection and the gathering process challenging to the smart government. Also, it can be challenging to decide on what is actually important from the massive amount of data.
- Government data can consist of unneeded and redundant data, therefore cleaning and reconstruction of data might be required.
- The data available can consist of different data formats or still manual paper information or even scanned documents with no stored fields making it hard to rely on it for analytical tools.
- The models that are generated from the analytical tools must be embedded in the operations and in the decision-making process to obtain the most use out of it.

– Testing and validating the models based on the different scenarios can be time consuming and tiring.
– Changing the culture and mentality of the people also can be considered as a challenge. Shifting from the regular decision-making process to advanced analytics tools can be challenging.

6.4 Global Cases for Benchmarking

The advanced analytics tools are still a trending and new technological advancement, but many governments or companies have decided to add the use of the tools to their strategy. The following cases can be used to benchmark with:

– A successful implementation of the advanced data analytical tools where at US Immigration and Customs Enforcement (ICE), the implementation of the tools where to better manage the overseas offices. The ICE manages more than 60 field offices in 45 nations. Till 2014 the decisions of choosing the ICE international offices were made based on subjective evidence or periodical surveys. But then in 2015 decided to shift to use the data of the workloads and the activities of the offices to decide on where to expand or where to shut offices without affecting the mission performance (Mahesh et al., 2016).
– Another case to benchmark with Virginia state case in building an integrated system of benefits eligibility of medical assistance. The offices that process those applications are often understaffed and overloaded with work (Alhamad et al., 2021; Alnuaimi et al., 2021; Alzoubi & Aziz, 2021; Ghazal et al., 2021; Hanaysha et al., 2021b). So, in 2015, Virginia Department of Social Services decided to take a different approach in addressing this problem. The information where gathered and analyzed by the use of the analytical tools to identify issues in processing the applications therefore enabling the DSS to provide better social services to the citizens (Mahesh et al., 2016).

7 Recommendations

This research paper aims to come out with new results in the field of smart cities that would help and support other cities to become smart and discuss the conflict, challenges and opportunities of knowledge-based economy and add value to their economies. Furthermore, this study provides a clear view of smart cities transformation and knowledge-based economy and the use of perspective and predictive analysis tools that help other researchers in the future to improve and develop studies regarding smart cities and get new results. The following are some points for smart Dubai to maintain the high-quality performance:

1. The result shows it is important to establish an information system and a collaborative platform of data for digital transformation of smart city.

2. Increase the benefits of technology in order to improve the economy.
3. All stakeholders should be engaged in the transformation to smart city and the build of the analytical tools' platform.
4. Create a roadmap to have a successful use of the analytical tools by monitoring, experimenting and implementation of these tools.
5. Investment in education, technology and communication in order to achieve competitive advantage against different economies (local and global).
6. Training program for the employees to develop, improve and enhance their skills and experience.
7. Engage and train the government sector leaders about the new data analytics and how it can benefit the economy.
8. Identify the gaps that are preventing the government from using the full capabilities of the use of this disruptive innovation tools.
9. Building a policy and a foundation of security, accountability that keeps privacy and promotes digital ethics.
10. Identification of the most important data relevant to the decision-making process and eliminating of redundant and unneeded data.

8 Conclusion

Due to the strong competition between cities and economies worldwide, Dubai became one of the most successful economies in the current century. By the vision of his highness Sheikh Mohammed Bin Rashid Al Maktoum vice president and prime minister of UAE, and ruler of Dubai, he builds up Dubai economy from oil economy to a non-oil economy and changed the economy to a diversified economy with various resources. There is numerous businesses in Dubai that made the economy stronger and more flexible, the strategies of his highness attracted most of the big companies and organizations worldwide to invest in Dubai and see Dubai as a very important business city in MENA region.

Dubai used the predictive analysis tools to know on what to depend in the future the use of that tools changed Dubai economy from oil to non-oil economy because they knew that in the future the world will not depend on the oil anymore, new resources are available now regardless oil and gas. The prescriptive analysis tools to know where Dubai economy want to go and what to do in order to increase and maintain its high performances and quality that attract business owners across the world.

Appendix

Smart Dubai—Interview Questions

As part of the information gathering of the Information Technology Management Course project, the following interview questions were prepared to be answered by an employee at Smart Dubai.

The questions were divided into sections as shown below.

Interview was conducted on 08/05/2019 at 10:45 AM with **Hamzeh Hamaraneh** who is the head of DATA Analytics in Smart Dubai.

Section 1: UAE Based Economy and Smart Dubai Contribution to it

1. **How can Smart Dubai empower or support UAE economy?**

   - We are empowering the government by using the tools and technology to represent the data and information.
   - By providing human resources to use the data in different uses of decision-making and across the city, while having the legislative and the authority to access such an information.
   - The Dubai data law that was released 2015. To be the first city to release such law, to regulate how the data used, stored, processed, and presented.
   - AI is filled by DATA. Not only we issued the law in 2015 but also we have the ethics of AI.

2. **What is the influence of smart Dubai on people of Dubai (residents, visitors, business owners, parents and families)?**

Smart Dubai has direct and indirect influence, by supporting the government and the non-government entities through our services so we can enable them to serve the society better like Dubai police, RTA, etc.

Another sector, government to citizens directly. Through channels like Dubai now through all the segregated government entities and bodies.

Traditionally, people will go through the normal norm of business. Now through the eservices we are providing better services by using DUBAI now by having a journey rather than the service itself. Customer focused.

3. **What challenges does Smart Dubai faces in the local and global market?**

   1. The most challenging area, or critical is the culture, people will feel that the paper is more reliable than the digital products. So changing the culture into knowledge society and paperless society is the challenge.
   2. Making people relay on the digital projects, technology advancements is moving into the society much higher than the culture will embrace it.

4. **What is Smart Dubai trying to achieve in the future?**

The goal is clear and very simple, to making Dubai the happiest city in the world; it is very simple but very big and challenging.

5. What new services, innovations and applications smart Dubai may provide to customer and Dubai society?

We have a lot of products and services, I think the main services are Dubai now, AI, and block chain.

Example of AI use case

An AI service that will match children to school, so we will make it easier for parents to choose the right school to their children. To reduce the burden that this task will have on any parents.

Use cases of AI

Dubai customs, thousands of containers are arriving to the port every day. AI will help them into deciding What to inspect and why and when. By analyzing the Volume, history and country the container came from.

In a nutshell, we have a lot of repetitive tasks and we tend to do it repetitively which can be resolved by the use of AI so we can focus on creative tasks.

To define any repetitive tasks to be automated.

Section 2: Analytics Tools Currently used in Smart Dubai

Does smart Dubai uses Predictive analysis, like machine learning, AI tools, and simulations.

Yes, they do.

Can you name few initiatives?

Many tools are used, our biggest initiative is the paperless initiative, by 2021 Dubai government will be the first government of paperless. AI technology can be used by eliminating any repetitive tasks. To call for the same documents repeatedly.

Do you think that those tools add value to the smart government and the knowledge-based economy?

Yes it does.

Does smart Dubai uses Prescriptive Analytics, like math programming models, optimization models, heuristics.

Hint: Those kind of tools often minimize the risks in making certain decisions related to costs and often important to use when there is time sensitive decisions to be made.

Exploring those tools, currently they are not using them.

Does smart Dubai uses those tools, and do you think they are adding any benefits to the government?

Of course it will add the benefits, like lowering costs, having those tools will benefit the government to make better decisions, like the supply and demand modules.

Can you give me a brief about Dubai Pulse?

Dubai pulse is a market place, we have tools and technologies and we are acquiring data sets and providing to the customers to make any analytical tools. So this service is provided for the public.

In addition, do you think it is related to the tools mentioned previously?

Yes it is, it is a representation of DATA to allow the different stakeholders to make better decisions.

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Machine Learning, IOT, BIG DATA, Block Chain and AI

Machine Learning Techniques for Stock Market Predictions: A Case of Mexican Stocks

Aqila Rafiuddin, Jesus Cuauhtemoc Tellez Gaytan, Gouher Ahmed, and Muhammad Alshurideh

Abstract Prediction of stock markets prices in a financial time series is very difficult and challenging task due to the nature characterized by dynamic, volatile, sentimental and chaotic behavior of the investors. The quantitative nature of data of the stocks gives a pace for the advanced simulation techniques, machine learning models a branch of Artificial intelligence learning process utilizes their predictive algorithms and forecasts the prices for future periods. With high productivity in the machine learning area applied to the prediction of financial market prices, objective methods are required for a consistent analysis of the most relevant existing literature on financial markets. Research revealed that most commonly used models for prediction of stocks are support vector machine (SVM) models and artificial neural networks (ANN). This research work is from the Mexican stock market with a comparison of SVM and ANN.

Keywords Artificial intelligence · Machine learning · Deep learning · Neural networks · Stock markets

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_100

1 Introduction

According to the efficient market hypothesis (EMH) by markets are expected to follow random pathways and making it more unpredictable leading to a continuous quest for a model and the most important and challenging problems involving time series (Atsalakis & Valavanis, 2009; Chen et al., 2017) highlighted ANN and SVM, with data pre-processing. The research work by Laboissiere et al. (2015) who continued with pattern recognition for financial market prediction in brazillian market. According, there is a need for profitable system that attracts lot of attention from the business and academia (Weng et al., 2017). Due to non stationary in nature its difficult to predict the stock market prices (Tay & Cao, n.d.; Zhang et al., 2017). They are dynamic, chaotic, noisy, non-linear series (Bezerra & Albuquerque, 2017; Göçken et al., 2016; Kumar et al., 2016), that are influenced by the general economy, characteristics of the industries, politics, and even the psychology of investors (Chen et al., 2017; Zhong & Enke, 2017). An evidence of the efficiency of financial markets is summarized by a model capable of consistently generating returns above the market indices and represents EMH and enable large profits with financial operations (Kumar & Thenmozhi, 2014a). According to Wang et al. (2012), initial techniques were moving averages, autoregressive models, discriminating analyses, and correlations but artificial intelligence is considered to be an ideal and promising area of the research in the prediction of time series. ANN techniques are designed to address chaotic data, randomness, and non-linearity (Zhong & Enke, 2017). Computational system with the technological advances made it possible to analyse large historical price databases by Chiang et al. (2016). The intense computational use of intelligent predictive models is commonly considered as machine learning techniques.

2 Machine Learning

Fundamental analysis information of financial statements for the evaluation of the company helps the investors in decision making through specific components and returns (Foster et al., 1984; Lev & Thiagarajan, 1993; Ou & Penman, 1989). Based on the past financial statements the intrinsic value of a company can be estimated and compared to market prices for investments. There is a deviation of market prices from the original value due to under reaction or overreaction of customers on the available information (Desai et al., 2004; Kothari et al., 2005). With the revision in beliefs and sentiments of the investors, earnings announcements, future dividends (Collins & Kothari, 1989), new information released affects the market participants to predict the future change in the prices (Bernard et al., 1997). For developing effective market trading strategies (Leung et al., 2000a). there is an immense need for accurate predictions of movement of stock price indexes Stock market prediction is regarded as a challenging task of the financial time series prediction process since the stock market is essentially dynamic, nonlinear, complicated, nonparametric, and chaotic

in nature (Abu-Mostafa & Atiya n.d.). Integration of Machine learning techniques with artificial intelligence systems seek to extract patterns learned from historical data in a process known as training or learning to subsequently make predictions about new data and integrate (Xiao et al., 2013). Empirical studies using machine learning commonly have two main phases. The first one addresses the selection of relevant variables and models for the prediction, separating a portion of the data for the training and validation of the models, thus optimizing them. The second phase applies the optimized models to the data intended for testing, thus measuring predictive performance. The basic techniques used in the literature include the following: artificial neural networks (ANNs), support vector machines (SVMs), Stock returns based on accounting variables are mispriced at time as a violation of efficient markets due to the varying time risk factors (Fama, 1991; Hirshleifer et al., 2012).

The layers of basic processing units of the neural networks are interconnected, attributing weights for each connection (Lahmiri & Boukadoum, 2015), which are adjusted in the learning process of the network (Kumar & Thenmozhi, 2014b), in the first training phase optimization of not only the interconnections between the layers of neurons but also the parameters of the transfer functions between one layer and another, thus minimizing the errors. Finally, the last layer of the neural network is responsible for summing all the signals from the previous layer into just one output signal—the network's response to certain input data.

Whereas neural networks seek to minimize the errors of their empirical responses in the training stage, an SVM seeks to minimize the upper threshold of the error of its classifications. Huang et al. (2005) took the training samples and transforms them from their original dimension space to another space, with a greater number of dimensions, in which a linear separation is approximated by a hyperplane (Kara et al., 2011). This algorithm, which is commonly used to classify data based on input variables in the model, seeks to minimize the margin of the classification hyperplane during the training stage of the model. The transformation of the space of original dimensions to the space in which the classifications are performed is done with the assistance of kernel functions, from estimated parameterization in the training of the model, as detailed by Pai and Lin (2005).

ANN and SVM have been successfully used for modeling and predicting financial time series. Although ANN can be one of the very useful tools in time series prediction, several studies showed that ANN had some limitations in learning the patterns because stock market data has tremendous noise, non-stationary characteristics, and complex dimensionality. ANN often exhibit inconsistent and unpredictable performance on noisy data (Huang et al., 2005; Kim, 2003; Kim & Han, 2000; Kumar & Thenmozhi, 2014b; Lahmiri & Boukadoum, 2015; Manish & Thenmozhi, 2005). Therefore, predicting stock price movements is quite difficult.

Thus, the literature regarding financial market prediction using machine learning is vast, which hinders revisions, systematizations of models and techniques, and searches for material to determine the state of the art. Tools are needed to objectively and quantitatively select the most relevant works for a literature review covering the most influential articles. Thus, the intention of this work is to present methods for the selection of the main advances in machine learning applied to financial market

prediction in the Mexican market clarifies a knowledge flow that literature brings a summary of the best procedures followed by the literature on applying machine learning to financial time series forecasting.

ANN is applied predict accurately the stock price return and the direction of its movement. ANN has been demonstrated to provide promising results in predict the stock price return (Avci, 2007; Egeli et al., 2003; Karaatlı et al., 2005; Kimoto et al., 1990; Olson & Mossman, 2003; White, 1990; Yoon & Swales, 1991). Leung et al. (2000b) examined various prediction models based on multivariate classification techniques and compared them with a number of parametric and nonparametric models which forecast the direction of the index return. Empirical experimentation suggested that the classification models (discriminant analysis, logit, probit and probabilistic neural network) outperform the level estimation models (adaptive exponential smoothing, vector auto regression with Kalman filter updating, multivariate transfer function and multilayered feed forward neural network) in terms of predicting the direction of the stock market movement and maximizing returns from investment trading.

Recently the support vector machines (SVM), has been also successfully applied to predict stock price index and its movements. Kim (2003) used SVM to predict the direction of daily stock price change in the Korea composite stock price index (KOSI). The experimental results showed that SVM outperform random forest, neural network and other traditional models (Huang et al., 2005), in their study, investigated the predictability of financial movement direction with SVM by predicting the weekly movement direction of NIKKEI 225 Index. Support vector machine (SVM) is a very specific type of learning algorithms characterized by the capacity control of the decision function, the use of the kernel functions and the sparsity of the solution. Established on the unique theory of the structural risk minimization principle to estimate a function by minimizing an upper bound of the generalization error, SVM is shown to be very resistant to the over-1tting problem, eventually achieving a high generalization performance. Another key property of SVM is that training SVM is equivalent to solving a linearly constrained quadratic programming problem so that the solution of SVM is always unique and globally optimal, unlike neural networks training which requires nonlinear optimization with the danger of getting stuck at local minima. Some applications of SVM to financial forecasting problems have been reported recently in most cases, the degree of accuracy and the acceptability of certain forecasts are measured by the estimates' deviations from the observed values. For the practitioners in financial market, forecasting methods based on minimizing forecast error may not be adequate to meet their objectives. In other words, trading driven by a certain forecast with a small forecast error may not be as pro1table as trading guided by an accurate prediction of the direction of movement.

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3 Objective

This research objective is to predict stock price movements based on three machine learning techniques: Support Vector Machines, Artificial Neural Networks, and Deep Neural Networks. The Machine Learning approach can be equally applied to forecast continuous and categorical variables. If the predictive variable is a continuous one it is said to be a regression based approach. Otherwise, when the predictive variable is a categorical one it is referred to a classification problem. This research considers stock price movements as a categorical variable since it is aimed to predict an "up" or "down" movement.

4 Methodology

The predictive model considers as target variables the daily closing prices of the main Mexican Stock Index (IPC) and seven representative Mexican companies: Grupo Alsea (ALSEA), America Movil (AMXL), Grupo Bimbo (BIMBOA), Cemex (CEMEXCPO), Grupo Carso (GCARSOA1), Grupo Mexico (GMEXICO), and Grupo Maseca (GRUMA). Data ranges from September 2013 up to December 2019 which acounts for 1,424 observations and were downloaded from the Bloomberg Terminal. Daily closing prices were transformed to log-returns and the categorical variable was built by the following conditional: if the log-return is positive then it is an upward movement (1), else if the log-return is negative then it is a downward movement (0). Whole estimations were performed in R v.3.5.1.

Based on Kara et al. (2011), the predictive model considers technical indicators as predictors such as: Simple Moving Average (SMAVG), Weighted Moving Average (WMAVG), Stochastic Slow (SLOWD), Stochastic Fast (FASTK), Relative Strength Index (RSI), Moving Average Convergence Divergence (MACD), Larry Williams Percent Range (WLPR), and Commodity Channel Index (CMCI). Predictors were not transformed to log-returns. Once, data was subsetted into training (80%) and testing (20%) sets. The first step was to perform a Principal Component Analysis to extract the main influential features where it was used the correlation matrix to scale the features. Figure 1 shows the PCA biplot of the IPC where it is observed that RSI, SLOW and FASTD are the most representative features along the PC1 axis. Meanwhile SMAVG and DIFF are the most representative features along the PC2 exists.

Once main drivers were identified that mostly explain the categorical variable ("movement"), they were normalized under the minmax strategy in such a way to speed the convergence process. Then, it was estimated a Support Vector Machine model considering a linear kernel. Next, a Neural Network was estimated with one hidden layer, three neurons, and a logistic activation function. Finally, the Deep Learning approach was considered by increasing the number of hidden layers in the

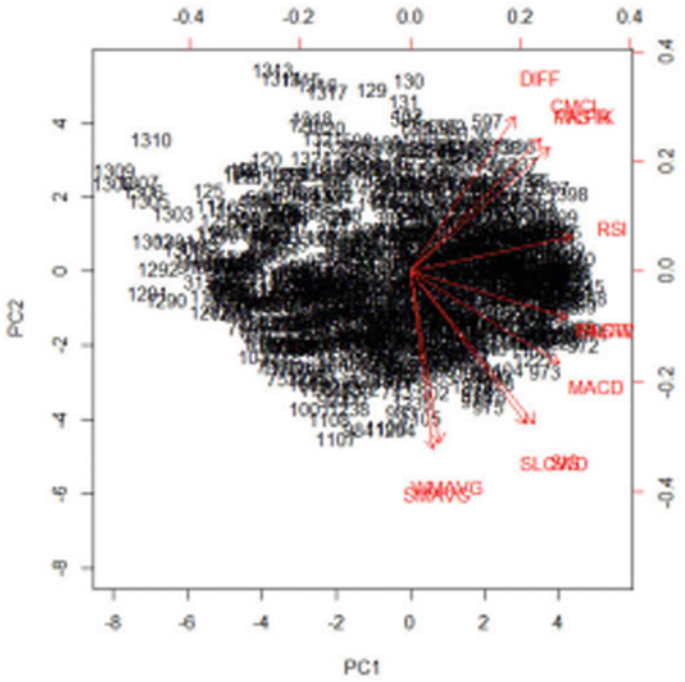

Fig. 1 The IPC principal component analysis

Neural Network. In both techniques it was estimated the confusion matrix to predict (classify) true positives, true negatives, false positives, and false negatives.

Findings Table 1 Summarizes the Support Vector Machine (SVM) and Neural Network (NN) market prediction accuracy levels. The NN columns are read as the number of hidden layers and neurons in the network. For example, (5,4,2) states three hidden layers, each one with 5, 4, and 2 neurons, respectively.

In most cases the NN model outperformed the SVM. But within the NN approach not all the Deep Learning estimations could outperform the single (3)-NN hidden layer. The greatest accuracy level was obtained on Gruma with a (5,4,2)-NN hidden layers. In this case, it is argued that an upward or downward movement can be predicted with a 75.1% accuracy level. The accuracy level was calculated from the confusion matrix. For example, a predicted movement with an accuracy level of 70.8% for GMexico under the SVM approach was obtained as (Fig. 2).

Other studies like (Huang et al., 2005) which got an accuracy level by the SVM model of 75% applied to NIKKEI 225 weekly prices. Kara et al. (2011) obtained a SVM accuracy level of 71.52%. Patel et al. (2015) estimated an accuracy level of 86.69% under the NN approach and an 88.69% accuracy level by the SVM model applied to the S&P Bombay Stock Exchange SENSEX.

Table 1 SVM and NN estimations

Index/company	SVM (%)	NN			
		(3)	(3,2)	(4,3,2)	(5,4,2)
IPC	68.0	69.2% (94.8)	67.5% (94.28)	68.5% (91.13)	68.9% (94.28)
Alsea	69.4	73.4% (94.40)	73.4% (94.90)	72.5% (93.58)	71.5% (93.40)
Amxl	71.1	72.5% (74.70)	74.8% (95.74)	72.1% (94.37)	70.8% (93.93)
Bimbo	70.4	71.5% (92.06)	67.5% (91.19)	70.05% (90.83)	71.8% (89.70)
Comex	71.1	69.2% (102.13)	66.9% (110.24)	70.8% (97.63)	72.5% (95.84)
GCarso	72.5	69.2% (102.13)	66.9% (110.24)	70.8% (97.63)	72.5% (95.84)
GMexico	70.8	73.4% (94.03)	74.4% (93.98)	72.8% (93.44)	72.5% (93.96)
Gruma	69.0	71.1% (110.55)	70.8% (108.90)	70.5% (110.13)	75.1% (95.93)
The Error estimation in parenthesis					

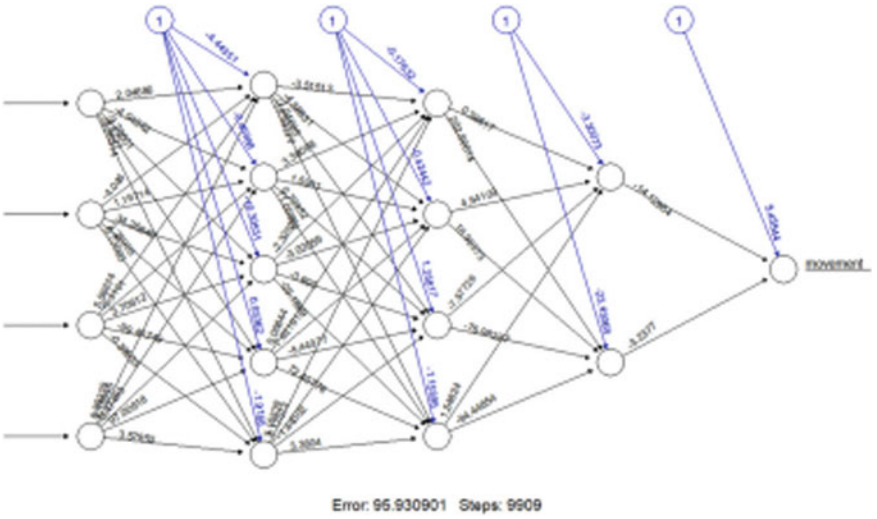

Fig. 2 Gruma NN deep learning estimation

5 Practical Implications

The importance of this research is for trading and investment strategy purposes that could be automated given an uncertainty environment (Al-Jarrah et al., 2012; Assad & Alshurideh, 2020a, b; Shah et al., 2020, 2021). Specifically, it is referred to Algorithmic Trading where behavioral patterns are analyzed, modeled, and predicted under mathematical approaches such as Machine Learning techniques (Al Shebli et al., 2021; Alhashmi et al., 2020; AlShamsi et al., 2021; Nuseir et al., 2021; Yousuf et al., 2021).

6 Originality

Most of research on Artificial Intelligence has been done on developed financial markets where liquidity and number of listed companies are higher than financial emergency markets such as the Mexican. It was shown for an emergency financial market that "market prediction" accuracy levels are similar to those obtained in other research works done on mode developed financial markets.

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Machine Learning Price Prediction During and Before COVID-19 and Consumer Buying Behavior

Tauqeer Faiz, Rakan Aldmour, Gouher Ahmed, Muhammad Alshurideh, and Ch. Paramaiah

Abstract In the unprecedented situation of COVID-19, the global economy has turned upside down. This has led to sudden and unprecedented pressures on products demand and price forecasting. The study utilized regression techniques to predict product prices during and before COVID-19 using multiple influencing factors such as increase of COVID-19 positive cases on daily basis, number of deaths on a particular day, and government restrictions level. The data was gathered from worldometers website and combined with local store on sales based on the date. The results were eye opening as the product sold in the months of Mach, April, May and June 2020 were different than last year. This means the customers buying habits were totally altered due to many reasons such as job loss, wages reduction due to remote working, or promotions. Moreover, these products prices were directly proportional to increase of new COVID-19 cases, rise of daily deaths and government restriction levels imposed during the pandemic. The study uses machine learning data mining algorithms such as Logistic regression (LR), Decision Tree, Random Forest and K-Nearest Neighbor. Decision Tree and Random Forest works best in the pandemic situation to predict

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_101

product price as compared to Logistic Regression and KNN. However, different outcomes were recorded when comparing the sales during pandemic and before pandemic.

Keywords Price prediction · Regression analysis · Covid-19 sales · logistic regression · Decision tree · Random forest · k-nearest neighbor

1 Introduction

The COVID-19 pandemic has turned the global economy upside down (Akour et al., 2021; Alshurideh et al., 2021; Nuseir et al., 2021a). The COVID-19 crisis is exerting sudden and unprecedented pressures on products demand and price forecasting (Al-Dmour et al., 2021a; Shah et al., 2021; Taryam et al., 2020). Many industries, starting from overseas travel to consumer goods have dropped in demand. Consumers are contracting for enormous discounts and asking for renegotiations (Abbas, 2020; Al-Dmour et al., 2021b; Aljumah et al., 2021). Dubai Economy and Trade licenses authority has confirmed increase of 179% issuance of online shopping trade licenses as compared to last year. Companies have to put their energy and resources to re-invent the ways to look into the market demand and price forecasting during this unprecedented and uncertain times to expand their business (Abdelnour et al., 2020; Al-Jarrah et al., 2012; Alzoubi & Inairat, 2020).

The aim of this study is to find out most selling products during the pandemic, see the change in product price over the period of four months, predict prices of most selling items in normal days as compared to products which have been sold during the pandemic.

2 Research Background

This research project compares the effect on product prices before and during the pandemic. Small to medium enterprises (SME's) deploy resources to understand the market situation based on collected data to uncover the best deals for consumers (Al Suwaidi et al., 2020; Al-Gasaymeh et al., 2020; Assad & Alshurideh, 2020). Product prices are dependent on various other industries e.g. oil, real estate and other inter-linked industries. US crude oil has gone negative for the first time in the history. An overflow of unwanted oil in the market caused US Oil price to plunge to almost − $40 a barrel (Ambrose, 2020). This focuses on looking at product demand during the pandemic and predict product prices and compare this result with the data available before the pandemic. Ministry of human resources and emiratization (the "MoHRE") has declared it legal to reduce employee salary until the COVID-19 crisis prevails (Barr, 2020). Organizations have reduced employee's salaries ranging from 20 to

35% in the UAE. There is no proper statistics on actual salary reduction as it varies from company to company. This makes consumer's buying power very limited and stress upon daily or weekly re-pricing of products.

Therefore, this research investigates "Re-pricing of products" during the COVID-19 pandemic as price prediction or forecasting has been investigated in best case situation so far. Nevertheless, predicting product prices in a crisis like COVID-19 has not been described in the literature. This article reports the internal and external factors involved in Re-pricing of products during the pandemic or emergency like COVID-19 and sales comparison will be made before the pandemic.

3 Aims and Objectives

The study will focus on analysing data mining techniques used to predict product prices during COVID-19, design and develop model based on the requirements, test the model accuracy, and deploy the model to the industry. Finally, this research will compare the results of findings before and during the pandemic. The overall research objective is to apply regression data mining technique to study the effects of prices on certain products during and before COVID. To accomplish this goal, the report will focus on the following major objectives:

RO1[1]: Obtain data and apply data mining techniques such as Logistic Regression, Decision Tree, Random Forest and K-Nearest Neighbour for price prediction during and before the emergency situation like COVID-19.
RO2: Determine how much of the variation in the dependent variable can be explained by the independent variables. In other words, this defines the strength of the relationship.
RO3: Build and Assess model accuracy based on the findings and suggest which model performs the best based on the given data.
RO4: Discuss the outcomes of different models.

Regression analysis is most widely used for forecasting, and this requires an expert understanding and readiness. Previous work on price forecasting contains all the required information to pursue with this report. However, researchers have focused on biological or health issues during H1N1 and Swine pandemics rather impact on pricing in unprecedented situation like COVID-19. Online collaboration required at each development phase with the SMEs to consider all important factors of pricing.

[1] Research Objectives.

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4 Literature Review

The purpose of this section is to discuss published work on price forecasting during the pandemic. Keeping this information in mind, different repositories of research articles were interrogated. There is adequate amount of research done in price forecasting, however, forecasting during the pandemic has never been carried out, which clearly indicates the research gap.

Support vector regression (SVR) against Long short-term memory (LSTM) neural network algorithms was used by Bakir et al. (2018). In their comparison study of SVR and LSTM, they introduced a framework to predict mobile phone prices in European shops. According to Bakir et al. (2018), better prediction performance was obtained with the use of multivariate models of SVR and LSTM neural networks. In fact, the Root mean squared error (RMSE) of €33.43 was recorded with SVR model but accurate prediction results were obtained using multivariate LSTM RNN model for next days' cost with an RMSE of €23.640. However, LSTM and SVR time series models work best in price prediction, but the authors have not shared any information of external factors effecting the product prices. In case of mobile phones, the stock can last for years but this will really change the discussion when items expiry date is taken into consideration.

Researchers studied the dynamic price forecasting in Simultaneous Online Art Auctions and investigated two questions: The first question referred to the function of price dynamics in predicting SOA and how it varied from the individual-auction case. The second question probed why the inclusion of price dynamics resulted in superior prediction, and they examined the role of bidder competition and its relation to price dynamics (Dass et al., 2010). The writers used functional data analysis modelling approach which is an emerging statistical methodology that works on functions observations for example price curves in online auctions. (Chen & Fan, 2010; Dass et al., 2010; Elgerd, 1982) had proposed FDA-based an alternate model to the Bass model for price forecasting in 2008. According to Dass et al. (2010) and (Elgerd, 1982), FDA belongs to Fuzzy Logic and Neural Network family as it mimics the continuity processing performed by the human brain. In their research contribution, they developed two main dynamic prediction models, DFM-I and DFM-II for price forecasting. In DFM-I, it incorporated both the price and the price velocity information until the time of prediction, whereas the second model (DFM-II) considered only the price path till the time of prediction. Both these models included static pre-auction information for example the opening price or the item characteristics). DFM-I outperformed all competing models in terms of predictive accuracy. Forecasting price dynamics in particular the price velocity has a major impact on forecasting price, statement made in their first conclusion. Though the context of "An effective pricing framework during COVID-19" is very much aligned with "Dynamic Price Forecasting in SOA", however, the most important factor of re-pricing during the pandemic situation and how other factors impact the product prices still remains buried. This article will primarily focus on the relationship of external factors on predicting prices during the virus situation.

The literature work discussed of Elgerd (1982)various stock price prediction techniques. Opinion mining or Sentiment Analysis in other words, was used to predict stock prices by using historical data. The prediction model training was based on messages which was grouped in to five classifications such as "Strong Buy", "Buy", "Hold", "Sell" and "Strong Sell". All other irrelevant data was discarded, and the purpose of this method was to check how human mood can be used to predict the stock. Support Vector Machine (SVM) has been used a lot for high dimensional data for time-series analysis due to its performance and the authors of this article tested this model for its popularity.

Lab of tropical crops information technology China (Mucedola, 2021) predicted price of vegetables using Back propagation (BP) neural network algorithm. Back Propagation NN has multilayer feed forward networks being trained by the error back propagation algorithm. The BP model contains input layer, hidden layer and output layer, with key attributes of which is that information transfers forward, and the error back propagation. The study revolved around the green pepper price prediction, which is produced locally, and its price fluctuated in recent years. The price is affected due to seasonal production, May to October each year is considered as off-season and busy season remains from November to April. Due to spring festival, the demand of green pepper becomes high during Mach and April. The article also indicates the change of price due to high temperature and rain fall. The price drop due to these external factors are negligible in the current scenario. In order to determine "Re-pricing" due to pandemic, it is necessary to analyze all the relevant impact factors to forecast the product prices. This research article will focus on predicting prices during the pandemic.

OSEMN framework covers all the steps from gathering raw data all the way up to analyzing data and building dashboards or reports (Faiz, 2019). This model contains the framework as (O)—Obtain raw data, (S)—Scrubbing or cleaning data, (E)—Exploring or Visualizing data to search patterns or trends, (M)—Modelling data for prediction, (N)—Interpret the results. Any project related to machine learning or data analytics always follow the given steps. "An effective Pricing framework during COVID-19" will be using the similar techniques discussed in "Scrubbing data for medium-sized enterprises" to pre-process data to make it fit for use. Data pre-processing techniques, finding outliers, and removing irrelevant information will be followed according to the framework mentioned in this article.

The airfare price prediction using machine learning techniques provides the best time for customer to purchase an air ticket before it gets increase (Elgerd, 1982). According to this technique, the most informative features such as departure time, arrival time, free luggage, days left until departure, number of transits, holidays, overnight flights and day of the week play a vital role in ticket prices (Elgerd, 1982). Eight different machine learning regression models were selected which includes, multilayer perception (MLP), generalized regression neural network, extreme learning machine (ELM), random forest regression tree, regression tree, bagging regression tree, regression SVM and linear regression. The historical data was gathered of a particular airline, and experimental models have shown that machine learning prediction models brought satisfactory results. They concluded that

"Regression Tree", "Random Forest Regression", and "Bagging Regression Tree" machine learning models brought accurate results while "Random Forest Regression" and "Regression Tree" outperformed considering the execution time.

There are numerous research articles based on price prediction using machine learning algorithms. According to Elgerd (1982), Regression Tree, Random Forest and Bagging Regression works the best to forecast airfare prices. The LSTM and SVR were compared (Elgerd, 1982) against the mobile phone prices prediction and they obtained best accurate results with these models. In a nutshell, articles reviewed in this research have used SVR, Random Forest and LSTM brought accurate results as compared to Nearest Neighbour and other similar machine learning algorithms. However, there is no single machine learning technique which works best with all kinds of data. This publication recommends that some other popular regression analysis techniques such as Multinomial Logistic Regression, Decision Tree, Random Forest and KNN should be used and evaluated for large amounts of data with multiple categorical fields. As the price prediction during the pandemic or emergency situation has not been explored before, so, certain parameters which affects the pricing were included such as promotions, new COVID cases, new daily deaths and restriction levels. Worldometers website provides covid information on daily basis of all the countries and the sales information were obtained from a well-established supermarket. The two data sets were combined together based on date column. There were almost 50,000 data rows which were sufficient to be used for model building. The data mining model accuracies were improved by discarding the irrelevant and multicollinear columns from the data and the results were compared against pandemic vs non-pandemic situation.

5 Methodology

This section focuses on data analytics project lifecycle and actual implementation of the problem discussed in aims and objectives of Sect. 3. Due to the unprecedented time of COVID-19, ecommerce has observed price fluctuations in different products. As mentioned in Sect. 1, customer's purchasing habits are shifted to selection based due to its limited buying power. Most of the business entities relies on price prediction framework to run their businesses. This data science project research is illustrated in the following Fig. 2, Research Methodology. As the past data will be collected and analyzed, the research will be a quantitative analysis. The whole research process will involve finding the most selling products in the month of March, April, May, and June and predicting the product prices during and before COVID-19. Regression data mining techniques such as Logistic Regression, Decision Tree, Random Forest and KNN will be applied, and the model outcomes will be compared and generalized. Descriptive analysis answers the "what happened" by summarizing past data, usually in the form of dashboards. In this research first we will create a dashboard to see most selling products using Microsoft Power Business Intelligence tool or Python coding

can also help to show graph for most selling products. The data will be imported to Power BI tool and a dashboard will be designed based on the requirements. Following reports will be generated using this tool:

- Top 5 most selling products (Sect. 3—Aims and Objectives), Frequency of change of Unit_price during the COVID-19 when there is increase of new cases diagnosed as COVID positive (Sect. 3—Aims and Objectives), Frequency of change of Unit_price of the most selling products before the COVID-19
- Filtering data to required months (i.e. March, April, May and June 2020)

The second type of analysis is the Predictive Analysis, and it answer the question "what is likely to happen". This technique utilizes previous data to make predictions about the future sales. Predictive analytics relies on statistical modelling to forecast. The accuracy of prediction depends upon the data quality and sufficient training dataset.

In this supervised machine learning problem, "Logistic Regression", "Random Forest", "Decision Tree" and "K-Nearest Neighbour" will be applied and their results will be recorded. The focus of this study is on data mining regression techniques, so the research approach of this study is quantitative. Secondary data (data from business or data resided in computerized databases) will be collected from the e-commerce store and will be used in this research. The Worldometers website provides COVID-19 cases on daily basis. A CSV file related to COVID cases is downloaded and will be merged with ecommerce file. The reason to merge COVID new cases and deaths information is to find a relationship among product Unit_price and daily new cases or new deaths. The purpose of this research is to explore the effect of product prices when new cases or deaths are increased, and the research approach is quantitative. Another most interesting feature of Government imposing restrictions to be followed during the pandemic will also be merged with the excel sheet.

The objective of this research is to understand change of certain product prices when the COVID positive cases are increased. In this study, the data science project methodology has been followed. There are several steps in data mining price prediction. In order to implementing these methods, Python machine learning libraries such as pandas, scikit learn, matplotlib, seaborn and sklearn will be used. Microsoft Excel and Power BI is also required for column addition and dashboard creation. All outliers will be checked and removed to pursue the analysis following the techniques mentioned in article "Multiple approaches on scrubbing data for medium sized enterprises" (Faiz, 2019).

According to Beklemysheva (2019), Tziridis et al. (2017), AlHamad et al. (2021), Nuseir et al. (2021b), Salloum et al. (2020), Ghazal et al. (2021), Alshurideh et al. (2020), Al Kurdi et al. (2021) implementing machine learning solutions using python is time saving as python offers number of frameworks and libraries. Python provides extensive libraries for machine learning such as data analysis, visualizing and provides machine learning algorithms. Model building is based on some certain steps as shown in Fig. 1.

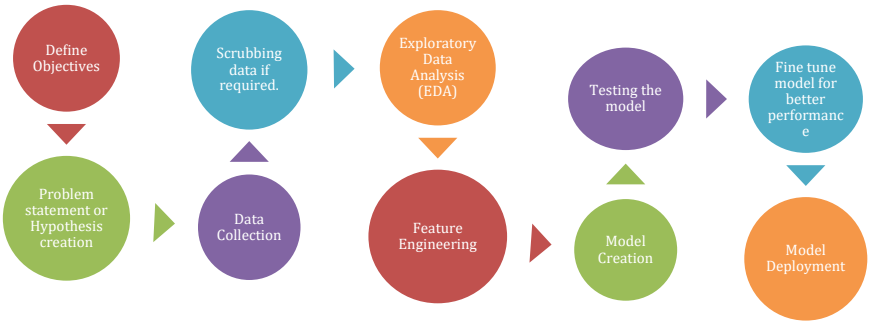

Fig. 1 Supervised learning—model building

6 Findings and Analysis

This section presents the results, and analysis relating to the prices of selected products during and before COVID-19 which is the aim of this research. Data Science project lifecycle methods is followed before building any model as mentioned in model building Sect. 5. Some fancy python coding is used to build the model. Let us understand the pandemic data used in this research first.

The dataset is obtained from a renowned E-Commerce store in UAE and is used for research purposes only. The company name will not be revealed due to non-disclosure agreement. The obtained data consists of 51,308 individual data rows. In this dataset, New_cases, New_deaths and Restriction_level columns are manually added using Microsoft Excel. The COVID-19 cases information is updated on regular bases on worldometers.info site. The site allows to download more than 200 countries daily COVID cases as a CSV file. The file was downloaded from the website and only UAE COVID cases were filtered from the file and merged to the sales report using Microsoft Excel according to the "Order_date".

There are 17 columns in the dataset, which are described below and a sample is shown in Fig. 2:

- **Order ID**—Customer order is given a unique id and it is auto-generated by the system at the time of purchase.
- **Order date**—It lists the date of purchase in 'yyyy-mm-dd' format.

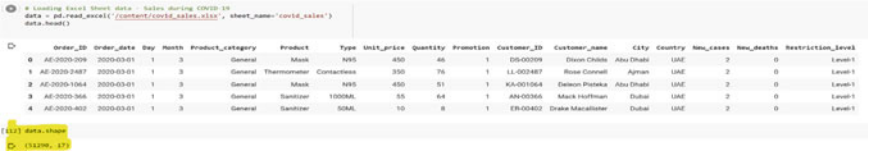

Fig. 2 Sample data

- **Day**—Day is obtained through Order date column and display the day of the month e.g. 1 represent first day of the month. The column has range of values from 1–31.
- **Month**—This column converts Order date to month and only month information is retained. The proposed dataset has month of March, April, May and June values.
- **Product Category**—It holds the product categories and has 4 distinct values. (1) General, (2) Fashion, (3) Fruits & Vegetables, (4) Electronics
- **Product**—One of the most useful columns and it consists of names of the products. The column has 34 unique products in the list.
- **Type**—Product is divided into further categories e.g. Mask has N95 and Surgical types.
- **Unit_price**—Actual price of the product and it's a numerical field.
- **Quantity**—Number of items ordered by the customer.
- **Promotion**—This tells whether the product is on promotion, 0 means product is sold on normal price, 1 means product is sold on offer price.
- **Customer ID**—This field contains customer id information.
- **Customer Name**—The column saves customer name.
- **City**—Name of the city where the product is delivered.
- **Country**—The column has single value as data is based on United Arab Emirates.
- **New_cases**—This field is inserted manually to establish relationship between number of products sold when the cases were increased. The data is obtained from worldometer.com website.
- **New_deaths**—This field lists the number of deaths on a particular day recorded during the COVID-19. This field is also taken from worldometer.com and merged based on the dates.
- **Restriction Level**—This field may affect the Unit_price as the Government of UAE was imposing different restrictions alerts on the public to contain the spread of COVID-19. The values are populated in the excel sheet based on the Ministry of Health and Emergency Crisis & Disasters Committee for COVID-19 pandemic announcements on different dates. The data is obtained from UAE ministry of health website (mohap.gov.ae). This field has five distinct alert levels which includes:
  - **Level-1** allows normal activities with precautions; **Level-2** requires physical distancing and restrictions on leisure and social activities.
  - **Level-3** applies restrictions on many activities including at workplaces and socially, to address a high risk of transmission; **Level-4** Extreme precautions to limit community transmission and outbreaks, while allowing some activities to resume whereas **Level-5** Drastic measures to contain the spread of the virus and save lives.

From the above datapoints, "Unit_price" will be dependent (target) variable and "Day", "Month", "Product", "Type", "Quantity", "Promotion", "New_cases", "New_deaths" and "Restriction_level" are the independent attributes.

First, let us understand the pricing changes during the COVID-19. Comparison is made on pure on-demand product pricing during the month of March, April, May

Fig. 3 Quantity sold

	Quantity			
Month	3	4	5	6
Product				
Dragon_fruit	624	1211	2153	1533
Gloves	3807	2285	3984	1620
Mask	7140	6367	7366	10706
Sanitizer	10874	10282	12732	13674
Thermometer	2990	2372	3950	4613
Vitamin_C	1523	7190	8356	8365
Water_melon	1284	181	265	87

and June 2020 as this was the peak time of COVID-19 pandemic. Figure 3 Sales Report offers several useful information to simplify the analysis report.

The significant change of "Unit_price" reflects that the price of Sanitizer was shifted 24 times during these four months, similarly, Vitamin_C had been modified 16 times, Mask prices 13 times, Gloves 4, Thermometer 6, Green_leaves 5, Hair_clipper 2 and Samsung Mobile 2 times. Next important feature of interest in the given dataset is "Quantity" sold during the pandemic. The Fig. 3, discovers that Sanitizers are at the top with around 47 K units sold, Mask holds the second place with 37 K, Vitamin_C is the third most demanding product, Thermometer, Green_leaves and Gloves are also among the top selling products category during this time.

The following two figures (Fig. 4—Change of Masks and Sanitizers Prices) are evident to see the change of Mask and Sanitizer prices during the month of March, April, May and June. The Vitamin_C, Thermometer, Hair_clipper and Gloves depicts the similar kind of behavior in these four months.

Sanitizer, Mask, Vitamin_C, Contactless Thermometer, Gloves, and Green_leaves are most selling products found in the given dataset as shown in the Fig. 5—Top Selling Products in COVID-19.

Monthly quantity sold of different products statistics is shown below. Dragon_fruit is included in this study because this is the top season for Dragon_fruit to be sold in the market. However, the demand of Dragon_fruit has gone down which can be proved when considering the data before pandemic.

Another useful graph that shows the distribution of quantitative data to facilitate comparisons between variables is box plot. The box depicts the quartiles of the dataset whereas the whiskers reflect the rest of the distribution. The box plot also known as box and whisker chart is a way of displaying the distribution of data based on the minimum, first quartile, median, third quartile and maximum.

Outliers can be seen in case of Vitamin_C and Thermometer in Fig. 4 Boxplot. However, this will not be removed as the Unit_price has been changed with respect to different factors. A violin plot is like box plot, except that violin plots show probability density of the data at different values. Some box plots and violin charts pertaining to the dataset are shown in Figs. 6 and 7.

Fig. 4 Change of masks and sanitizers prices

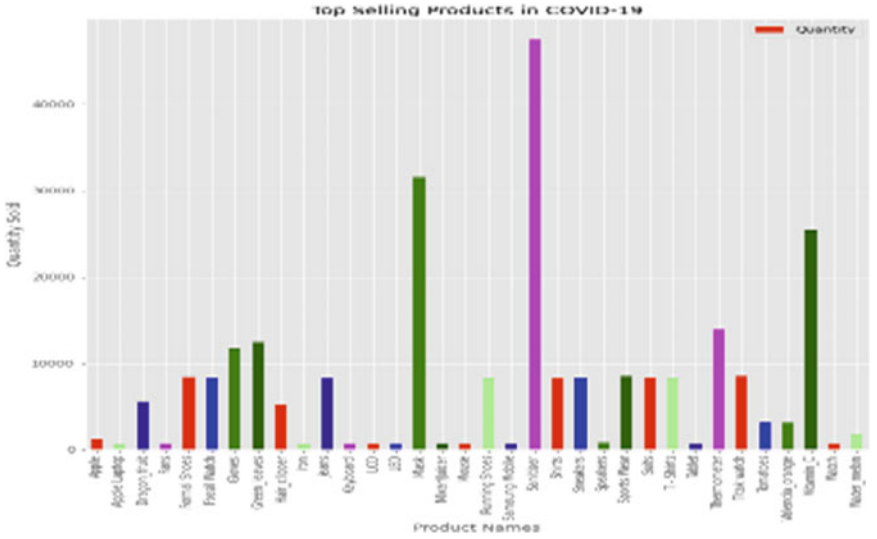

Fig. 5 Top selling products in COVID-19

Unit_price of Mask and Thermometer seems to be spread out in the above violin graph. The value of Unit_price ranges from 5 to almost 850.

Product Mask sub-category N95 and Surgical Masks prices are varying with respect to time, Similarly, Vitamin_C 20Tab bottle and Contactless Thermometer prices have changed slightly as shown in the Fig. 8 Violin Chart.

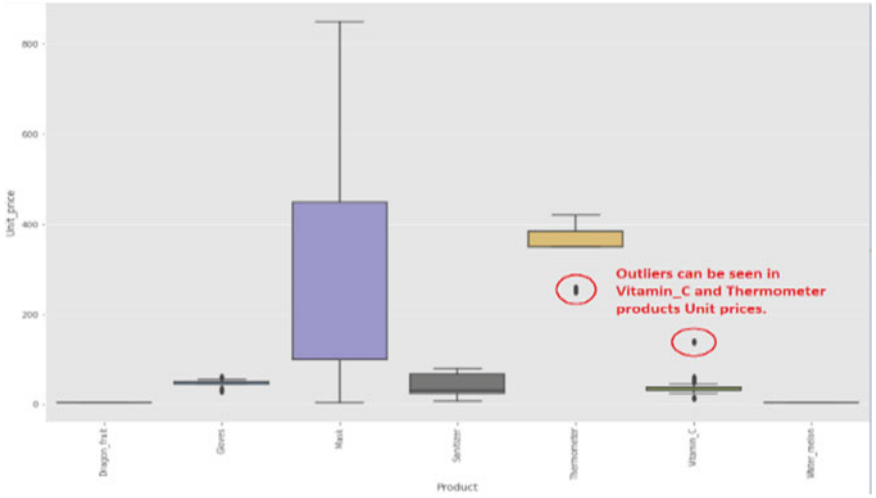

Fig. 6 Boxplot

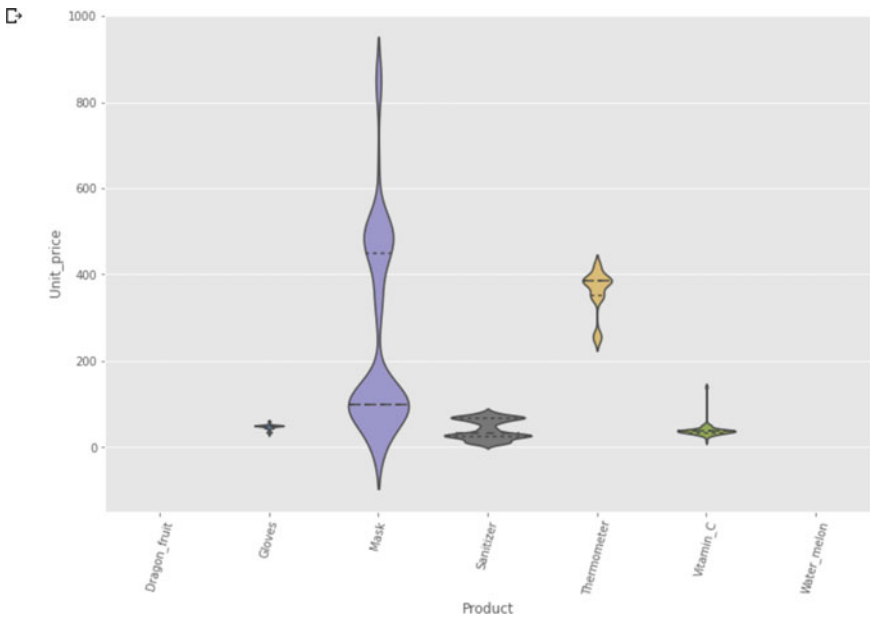

Fig. 7 Product prices during COVID

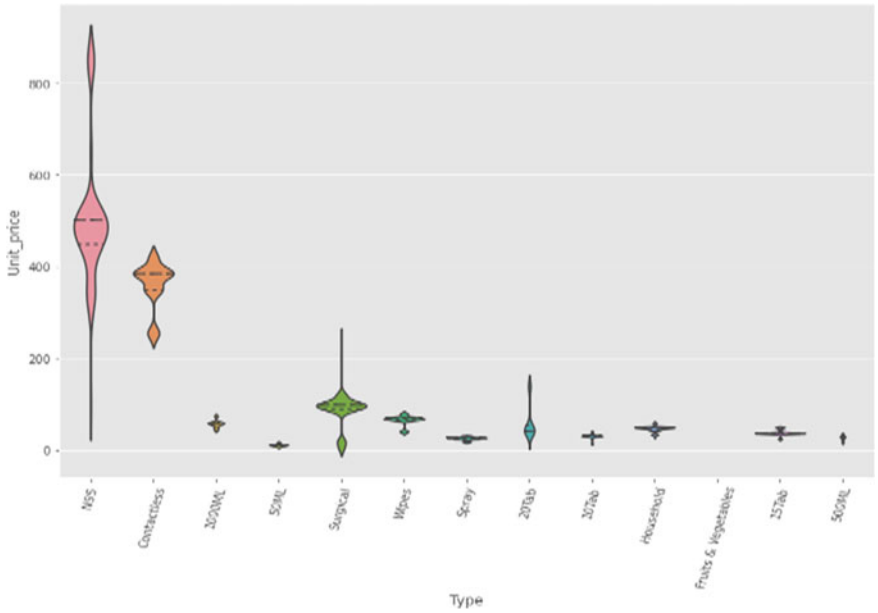

Fig. 8 Violin chart—product sub-categories

The Swarm plot Fig. 9, displays the different unique values of the Unit_price of selected products. According to this graph, 12 different masks prices are recorded, and other products prices are self-explanatory.

Fig. 9 Swarm plot during COVID-19

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The data obtained from the business (raw data) is not always numerical while mathematical formulas require numerical data. This section explains on finding useful information in your data and transforming them into format that is suitable for model building in machine learning. Feature engineering is divided into following categories:

- **Feature Selection**: All attributes in the data are not equal in preference and magnitude. It is important to select a limited subset of features from the large features pool. A key to features selection is to select such attributes which shows the relationship between dependent and independent variables. There are few attributes which are more handy than other attributes to ensure the model accuracy. All irrelevant data attributes are dropped from the dataset after looking into correlation matrix of exploratory data analysis section. Order_ID, Order_date, Product_category, Customer_ID, Customer_name, City, Country, Month and Quantity columns were dropped from the dataset.
- **Feature Transformation**: This covers scaling and dealing with null values. Log functions are used to reduce data skewness. The data used in this research project is clean and fit for model building.
- **Feature Extraction**: When dealing with huge data, it requires processing and large number of variables consumes lot of processing power and memory. Therefore, duplicate data should be removed, or dimensionality of such variables should be removed.

As of now, there is a strong correlation among dependent and independent variables and it's time to build the logistic regression models in SKLearn. Logistic Regression model in machine learning is useful for discrete dependent variables as well as categorical variables.

Multinomial logistic regression is appropriate for categorical data. As Scikit-learn is shipped with solvers, Stochastic Average Gradient descent solver technique will be used as it is fast for big dataset with 1000 max iterations taken to converge. Mean absolute error (MAE) and Root mean squared error (RMSE) are useful common metrics to measure accuracy.

Decision Tree Regression Model—Decision tree model random_state is 101, this will decide the splitting of data into train and test values. Setting random_state a constant value will make sure that same sequence of random numbers are generated each time when you execuate your model.

Random Forest—There are several reasons to use the random forest such as high dimensional data, avoids overfitting and helps to see features importance.

Random Forest suggest that Promotion has 16% impact factor on dependent variable that is Unit_price, New_cases contribute to 9%, while product type Type_Fruits & Vegetables influence the model by 8%. There are many other factors which are impacting the Unit_price and depicted in the above Fig. 10.

K-Nearest Neighbors (KNN)—KNN is applied with n_neighbors equal to 3.

Finally, the accuracy graph shown below Fig. 11, depicts the model's accuracies. According to the sample data fed into these models, the Decision Tree and Random

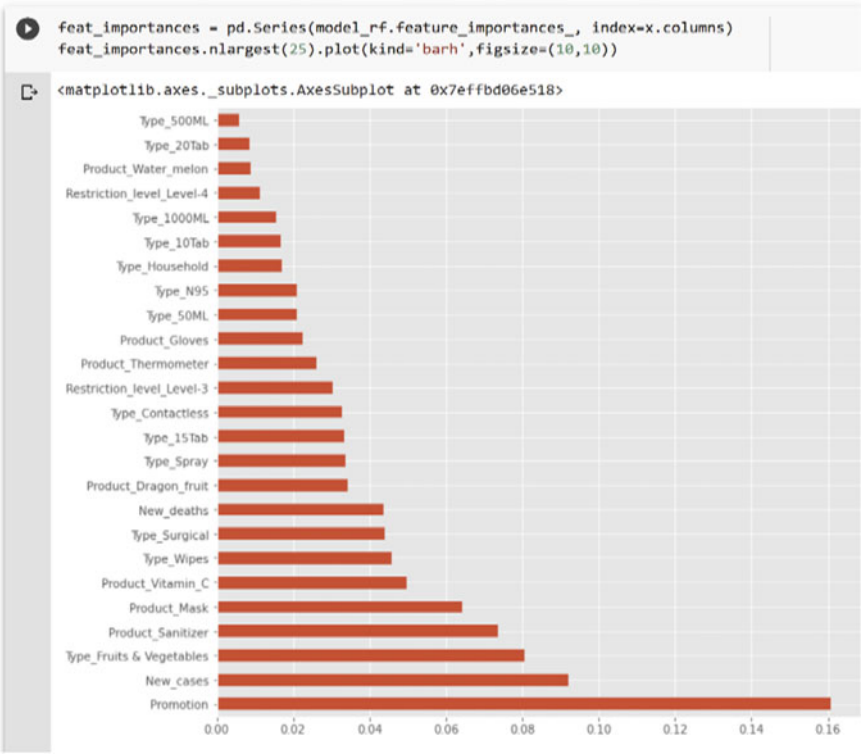


Fig. 10 Feature importance

Forest brings the highest accuracy level of 99%, whereas KNN is 83% and the least accurate model is the Logistic Regression in the current scenario.

It's time to understand data before pandemic. Similar approach is followed to understand the data before COVID-19. The top 5 most selling products before the pandemic are Green_leaves, Jeans, Titak watch, Sports Wear, and Formal shoes as shown in Fig. 12. To compare the similar product prices sold during the COVID-19, all other products are dropped for the analysis and the price distribution before COVID-19 is shown in (Fig. 13).

The product "Mask" of "N95" and "Surgical Mask" types prices are shown in the graph for the months of March, April, May and June 2019. The values displayed in the Fig. 15 below are stable throughout these three months and no noticeable changes are recorded.

The correlation matrix in Fig. 14, highlights the positive and negative correlation between quantity and moth variables.

The Swarm plot in Fig. 15 indicates the different prices of products in the given dataset which appears to be constant. The OLS matrix in Fig. 14 below lists the R-squared value and P value which is appropriate for this dataset.

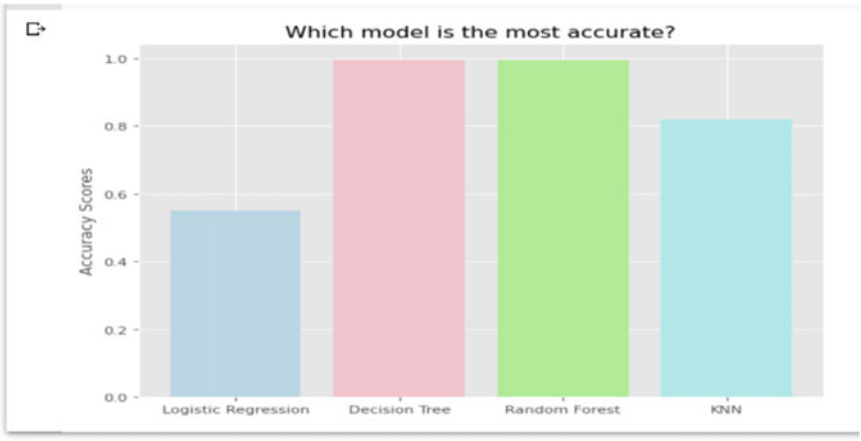


Fig. 11 Model accuracies

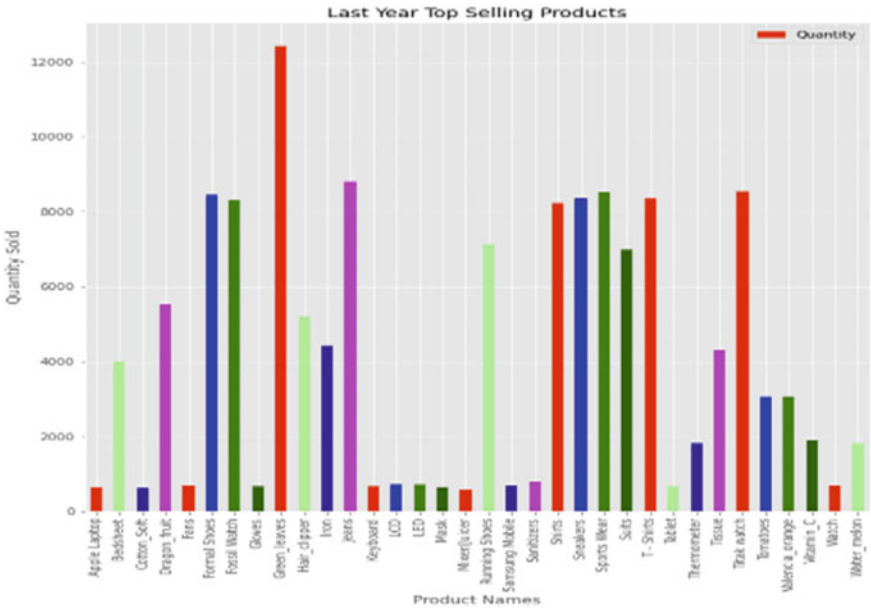


Fig. 12 Last year top selling products

The data is split into training and test sizes, 70% of the data will be used for training purpose and remaining 30% would be considered for testing.

Models' accuracy Scores—After passing this data to Logistic Regression, Decision Tree, Random Forest and KNN, model accuracies were recorded as follows.

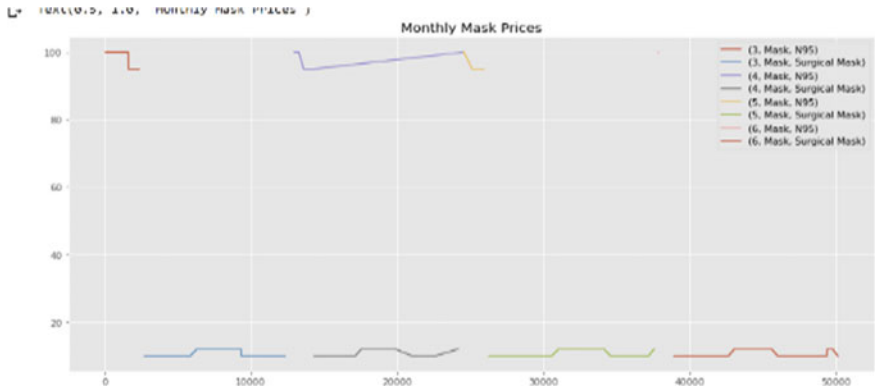


Fig. 13 Price distribution before COVID-19

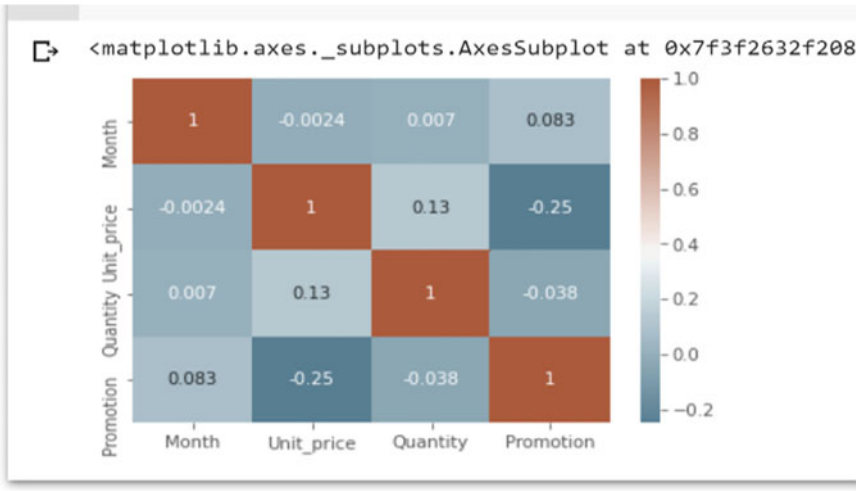


Fig. 14 Correlation matrix

All the four models are predicting almost the same and their predictions scores are identical as shown in the Fig. 16.

7 Results Comparison and Recommendations

In this study, logistic regression, decision tree, random forest, and knn regression models were applied to the collected dataset, and the following result comparisons are made.

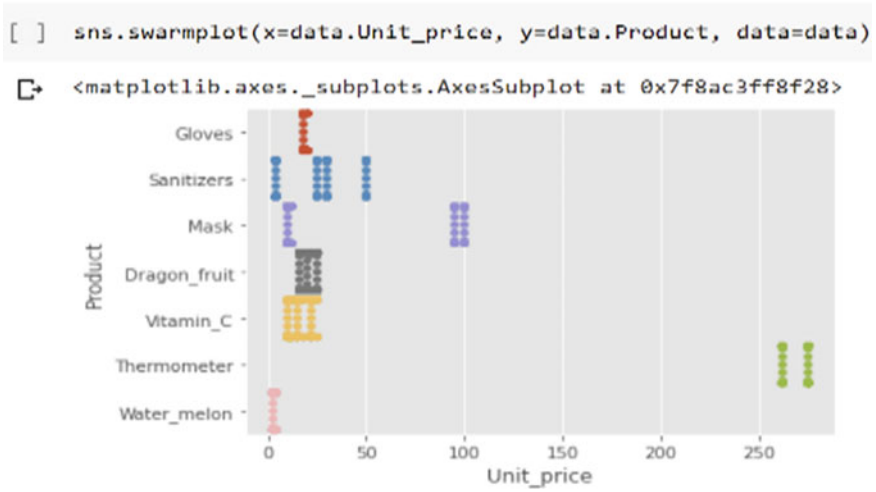


Fig. 15 Swarm plot before COVID-19

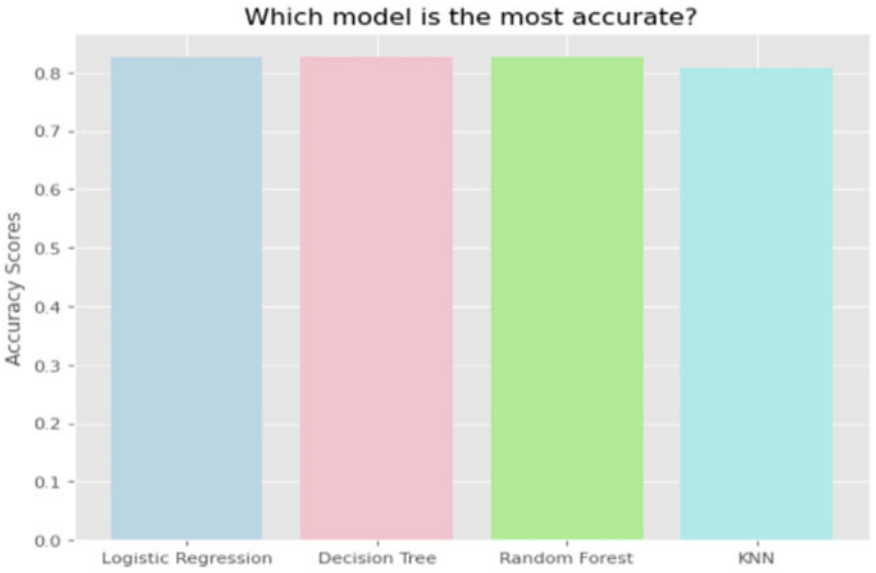


Fig. 16 Model accuracies before COVID-19

Starting with the features used in both datasets (during and before covid-19) discussed in Sect. 4, there were 17 features used during the pandemic and 14 features were used before covid-19. Addition of these extra four columns during the pandemic is explained and supported by arguments in previous sections. The New_cases, New_deaths, Restriction_level, Promotion, Quantity, Months and Promotion are the

most important features influencing the Unit_price. Both datasets share different outcomes in terms of most selling products. During the COVID-19, the most selling products were "Mask", "Gloves", "Sanitizers", "Contactless Thermometers", "Vitamin_C", and "Green leaves", whereas before the Covid-19 factor, the top selling products were "Green leaves", "Jeans", "Titak watch", "Sportswear" and "Formal shoes". Comparing and contrasting these two different outcomes support the initial argument mentioned in Sect. 1 that the consumers buying habits were changed and customers were buying the products as per the situation. As there were no physical activities outside the house, the sales of footwear, clothing and other leisure products were gone down drastically.

During the pandemic, some products prices were dependent on certain conditions. The Swarm plots shown above are evident that the Mask and Sanitizer prices were changed due to certain conditions while it remained constant before the pandemic. According to the regression models used in last section, prices of mask, sanitizers, gloves, vitamin_c and thermometer were changed (swarm plot) due to the following impact factors:

- Increase in covid-19 positive cases
- Number of daily deaths increased during the pandemic
- When Government was imposing restrictions to follow health and safety precautions
- Product demand was increased

The two correlation matrixes in Table 1 tabulate the relationship between dependent and independent variables. There is a slight relationship between dependent and independent variables however, multicollinearity problem exist in the dataset as independent variables are correlated as well. New_deaths and New_cases are strongly correlated independent variables in this scenario. As the focus of this analysis is to find the effect of COVID-19 impact factors on Unit_price of different products, so discarding these attributes will not serve the purpose. A similar kind of dilemma has been noticed in the dataset used for before COVID-19.

Table 1 Correlation matrixes (During & Before COVID-19)

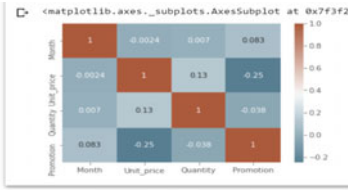
Correlation Matrix – During COVID-19	Correlation Matrix – Before COVID-19
	

Table 2 Features importance

	During COVID-19		Before COVID-19	
	Random forest		Random forest	
1	Promotion	16%	Promotion	29%
2	New_cases	10%	Dragon_fruit	14%
3	Fruits & Vegetables	8%	Fruit & Vegetable	8%
Decision tree			*Decision tree*	
1	New_cases	24%	Dragon_fruit	24%
2	Fruit & Vegetables	24%	Thermometer	16%
3	Promotion	18%	Promotion	15%

The top three important features which are influencing the model are listed in the following Table 2 based on the two datasets. According to the Random Forest, the top feature impacting the model is Promotion field during the COVID-19 and before the COVID-19, whereas Decision Tree has two variants at the top level which is New_cases in the COVID-19 situation and Dragon_fruit before the pandemic. The second most feature influencing the model is New_case and Dragon_fruit in Random Forest with the values of 10% and 14% during and before COVID respectively. The Decision Tree's second most impacting features are Fruits & Vegetable and Thermometer during and before the COVID-19 with distribution of 24% and 16% accordingly. Promotion comes at number three with the values of 18% and 15% influencing the DT model during and before the pandemic. Here, only top 3 features are discussed.

Four regression techniques were applied to the two datasets as discussed in Sect. 4. The datasets were split into training and testing purposes. The training set data was set to 70% to build the model while remaining 30% data was used for model evaluation. All categorical variables were converted to dummy variables using panda's built-in library. Table 3 displays the accuracy scores obtained when applying Logistic Regression, Decision Tree, Random Forest and KNN to the data tables. Accuracy evaluation metric is used to determine how good our model is, based on dependent and independent variables. During the COVID-19 situation, Logistic regression accuracy scores are 55.1% which means the model has been failed to produce the accurate predictions. KNN accuracy scores are 81.8% which is fairly good. On the other hand, Decision Tree and Random Forest predicted 99% accurate results and standout from the rest.

Before COVID-19, the models' predictions are almost same as the number dependent variables used in the dataset was fairly simple and straightforward. That is why the differences are not significant in these four models. According to the Table 3, first three models (LR, DT and RF) have similar 82.5% accuracies while KNN is reduced to 1.9% and was recorded 80.6% accurate predictions. Figure 17—Accuracy scores signifies the comparison accuracy scores of the mentioned four models.

Table 3 Accuracy comparison

S. no	During COVID-19—accuracy results		BeforeCOVID-19—accuracy results
1	Logistic regression	55.1%	82.5%
2	Decision Tree	99.2%	82.5%
3	Random Forest	99.3%	82.5%
4	KNN	81.8%	80.6%

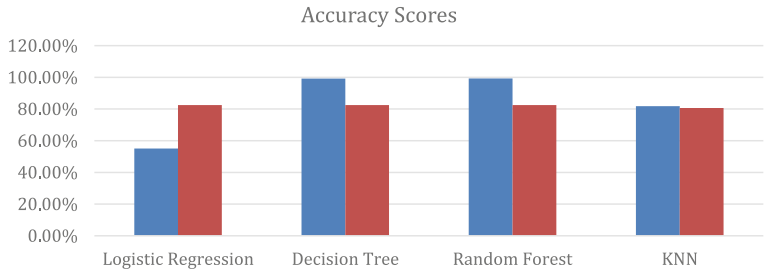


Fig. 17 Accuracy scores

There could be many factors that may have contributed to this Logistic Regression inaccuracies such as it requires more data, weak relationship, or multicollinearity.

8 Conclusion

This research focused on regression analysis during the COVID-19 pandemic. It predicts the unit price of most selling products during the COVID-19 and compares the prediction with the last year data i.e. before COVID-19. According to the findings obtained in Sect. 6, Masks, Sanitizers, Gloves, Vitamin, Contactless Thermometers are the most selling products, and it makes sense as well. During the COVID-19, daily routine activities were badly affected, and people were forced to practice social distancing. That is why, people were purchasing the items which were highly recommended by doctors and government officials.

Decision Tree and Random Forest showed the maximum accuracy score of 99.2% during the pandemic. Which means these two machine learning algorithms are reliable for e-commerce price prediction based on multiple independent variables. The second accurate model was K-Nearest Neighbor with the accuracy score of 81.8% which is again acceptable results for this kind of data during the COVID-19. Since, Logistic Regression gave the least accuracy score of 55.1%.

The accuracy score of Logistic Regression, Decision Tree and Random Forest was the same as 82.5%, while accuracy score of KNN model was 1.9% less than the rest. However, all the model's accuracy score is above 80% which makes all of the

somewhat acceptable for this situation. The reason for this was that the Unit Price of products stayed constant throughout the four months. Which is why all these models behaving the same.

The future augmentation to this study is to collect data from multiple e-commerce stores from different emirates (states) and pass this data through models currently used in this study, mentioned in Sect. 6. The relationship between dependent and independent variables should be re-evaluated to see the patterns. Moreover, models accuracy should also be compared to form a generalized opinion of these findings.

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Secure CoAP Application Layer Protocol for the Internet of Things Using Hermitian Curves

Raja Masadeh, Omar Almomani, Esra Masadeh, and Ra'ed Masa'deh

Abstract Internet of Things (IoT) is a modern technology that allows devices to sense status and take suitable reactions without human interference; this leads machines to interact directly with another machine, called machine to machine (m2m) communication. Many network technologies were involved in making the IoT idea work well. Devices in IoT are connected through the wireless network. Thus, different protocols on different network layers are used in IoT. One of the primary routing protocols used on the application layer is Constrained Application Protocol (CoAP) which is a new web application transfer protocol. Where it is better suited to constrained environments than HTTP for IoT. In this study, Hermitian-based Cryptosystem (HBC) is applied on the CoAP protocol in order to increase the security of IoT. The Hermitian curve is an algebraic geometric curve capable of generating a vast number of points. Simulation results are presented, showing significant performance improvements of AG codes over Hermitian codes against Reed-Solomon (RS) codes and Elliptic Curve Cryptography (ECC). This study proved that HBC outperformed the RS and ECC in terms of several points and key length, which leads to increase security.

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_102

Keywords Internet o Things (IoT) · CoAP · Security · Hermitian curve · Hermitian based Cryptosystem (HBC)

1 Introduction

Internet of Things (IoT) is a modern concept, appears in the latest few years. It consists of two terms: Internet and Things. The idea behind this concept is to connect any item in the world using the Internet. Such items or Thing are not only smart devices (Yassein & Aljawarneh, 2017; Yassein et al., 2016). A milk bottle in your fridge that is supplied by a sensor might be connected with the shopping list on your mobile phone. In case that the milk bottle is empty the sensor sends a message to your phone to add milk as one of the items on the shopping list. Also, the coffee machine may be connected to the Internet with the alarm on your smart phone, in order to get the coffee ready when you are awake. In this case the mobile sends a message to the coffee machine to turn on and get the coffee ready.

Since lifestyle become more complicated and connected technology take the most important responsibility to make such communication become true using the most important concept "Internet of Things". As shown in Fig. 1, Cisco (Kalyani et al., 2015) had done an analysis about the number of devices connected to the internet over years with respect to world population. The study shows in 2015 the population of the world was about 7.2 billion and about 25 billion devices were connected to the internet, which means each person in average used about 3.47 devices. However, a huge growth is expected in 2020. The study expected the population to become about 7.6 billion, however about 50 billion devices expected to be connected to the internet, which is in average about 6.58 device for each Pearson.

The first appearance of IoT was in 1999, by a group of network specialists who utilized the preexisting sciences such as radio frequency identification (RFID) and emerging sensing technologies (Evans, 2011; Hart & Martinez, 2015; Kalyani et al., 2015). Moreover, IoT include sensor networks that use sensors to read the status of a specific device in specific time and send the information to a sink node to take the appropriate action. The flow of the information should choose the best path between nodes, here appears the responsibility of the routing protocol used (Yassein & Aljawarneh, 2017; Yassein et al., 2016). Many routing protocols are used in IoT such as 6LowPAN-IPV6 over IEEE 802.15.4, Routing Protocol for Low Power and Lossy Networks (RPL) and Constrained Application Protocol (CoAP).

CoAP is a routing protocol that stands on the application layer. It aims to take place of HTTP protocol. This protocol was designed to meet low power devices with low overhead and multicast support. CoAP was also build as an alternative protocol to connect low power devices to the internet.

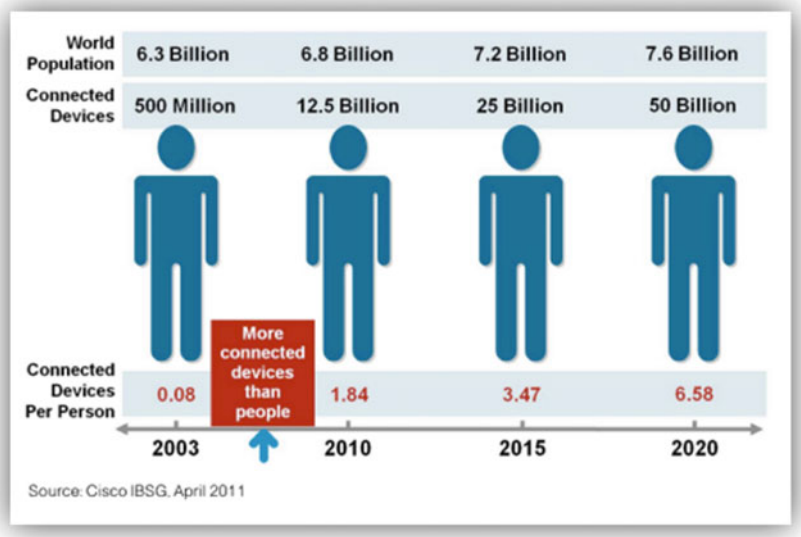

Fig. 1 Cisco analysis of IoT (Kalyani et al., 2015)

The main issue that faced the CoAP is the security. Many researches are suggested many solutions in order to solve this problem. Such as the data encryption standard (DES) which was the most familiar and used over than 30 years but now it has a main drawback which is easy to crack by any attacker; and the advanced encryption standard (AES). While, there is another algorithm is not used in CoAP till now which is called Hermitian curves (Rovi & Izquierdo, n.d.). Which is algebraic geometry (AG) curve that plays a main role in coding theory and cryptography. Moreover, the main goal of using AG is to create an effective coding and secured system.

The testing environment will use Contiki-Cooja 3.0 simulator. The difficulty of this simulator that it is not documented. However, all IoT protocols are well programmed which make the environment easier for the researchers than start from scratch. The Contiki-Cooja is written in two programming languages JAVA and C. the windows of the simulator are written in JAVA while the nodes inside and the flow of scenarios is written in C.

The reset of this paper is organized as follows: Sect. 2 contains the background in detail for both CoAP and Hermitian curve. Section 3 presents the related work. While Sect. 4 illustrates the proposed algorithm. Section 5 presents the simulation results. Finally, Sect. 6 draws the conclusion.

2 Background

2.1 Background of COAP

The most challenging mission in IoT is planning and designing a secure network and suppling end-to-end connection. In addition to that, security is the most significant factor in IoT because the most of interchanged packets and information are secret and critical. The main issue could be occurred when adding security to the network because it leads to consume more energy, since it is immediately related to the network lifetime. Thus, many researches presented to examine this problem, by using some traditional security techniques and try to adopt them into IoT. In this section, CoAP protocol is discussed.

Lately, the IETF constrained RESTful environments (CoRE) working team purposes to share the standardization and permit to combine between the constrained devices and the internet at the service level. Thus, they presented a new protocol which is called Constrained Application protocol (CoAP) (Rovi & Izquierdo, n.d.). Which is similar to the application transfer model of HTTP and execute some its characteristics. One of the most aim of CoAP is designing a specific requirement web protocol that goals to utilize in 6lowPAN, taking into account the structuring automation, power and other M2M (machine to machine) applications which are used in smart towns (Kushalnagar et al., 2007). Thus, these applications can be managed by using CoAP protocol which leads to rise the significance of web services during the daily lifetime for people. However, CoAP use UDP connection protocol between client and server by default to guarantee datagram arrival even through connectionless (Kerasiotis et al., 2010). The features of CoAP that recognize from other protocols that make it more suitable for constrained network and devices are presented in the following (Kovatsch et al., 2011):

- Web protocol that fulfills M2M constrained requirements which is consolidated protocol that is designed for constrained nodes. Moreover, it is suitable and applicable on RAM of 8–12 K and 8–16 bits microcontroller nodes.
- Simple caching and proxy abilities, where this protocol props caching, and the last responses could be cached in case the proxy is utilized in order to reply later such as the work of agents when they in the sleep mode.
- UDP binding that supports reliability using the multicast and unicast requests. In other words, CoAP has the choice to transmit a large number of packets by using UDP with reliability guarantee using Back-off algorithm. In addition to that, supporting the multicast requests but the reliability is not guarantee.
- The variety of message exchanging, which means this protocol permits to read, create, delete, modify and update a resource on any node because it depends and based on REST architecture.
- Content type and URI support. That means CoAP supports all the huge media types.

As mentioned above, CoAP is similar to the application transfer model of HTTP and execute some of its features. Thus, the standard methods which are completely supported by CoAP such as POST, PUT, DELETE and GET methods which are close to HTTP methods. In addition to that, these methods capable to monitor and effect the resources. These methods are presented as follows (Shelby et al., 2014):

- POST, this type of methods is used when a new subordinate resource is required in order to be differentiated under a present resource URI.
- PUT, this method is used within updating or creating a resource stable with URI that is defined in advance.
- DELETE, this type is used in case of deleting a URI specified resource.
- GET, this method is utilized in order to gain any resource information which is known by using URI.

As shown in Fig. 2 CoAP has client—server interaction model is similar to HTTP (Levä et al., 2014). When the sender (client) sends a request for any action, the receiver (server) replies with response message that includes the resource representation and the response code. However, CoAP functions the roles of clients and servers at the same time. CoAP achieves M2M requirements through supporting asynchronous operations over the UDP. This operation is done by using four exchange messages which are CON, Non-Con, ACK and REST as presented in Fig. 2.

2.2 Hermitian Curves

The AG curve is by depicting the number of points which accepted the curve equation which is called point on the curve. Thus, this curve is called either a projective curve because j represents the x-axis, k represents the y-axis and s represents the z-axis, which means it represents three—axis (j, k, s) or affine curve in case represents two-axis (j, k).

The projective Hermitian curve which is defined over a finite filed (2 m) where $b = \sqrt{f}$ and $f = 2\ m$ is a finite filed length (Alzubi, 2015), the proactive Hermitian curve is mathematically modeled by the following equation (Mohammad, 2017):

$$H(j, k, s) = j^{b+1} + k^b w + k s^b$$

If all partial derivatives of the curve do not disappear at this point on the Hermitian curve, $H(j, k, s) = 0$, the Hermitian curve is smooth, or the projective points must be nonsingular. The curve is considered to be nonsingular or smooth if all of the points that fulfill it are nonsingular (Carrasco & Johnston, 2008).

These three partial derivatives make the Hermitian curve smooth or nonsingular (Mohammad, 2017):

$$\frac{\partial H(j, k, s)}{\partial j} = (b + 1) j^b = j^b$$

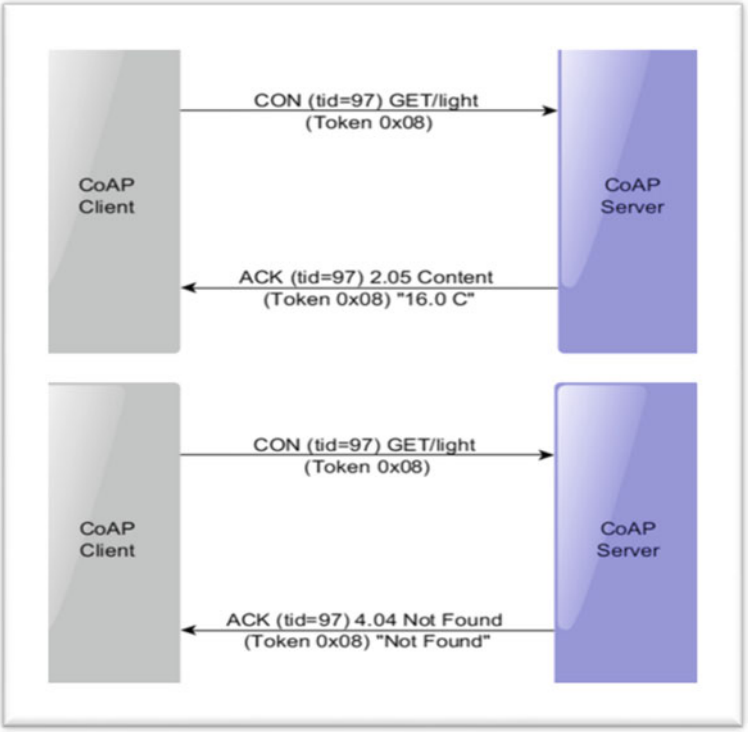

Fig. 2 CoAP transaction model (Levä et al., 2014)

$$\frac{\partial H(j,k,s)}{\partial k} = bk^{b-1}s + s^b = s^b$$

$$\frac{\partial H(j,k,s)}{\partial s} = k^b + bks^{b-1} = k^b$$

The only point where all three partial derivatives disappear is (0, 0, 0). However, this is not a point in projective space, the curve is smooth, and all points are nonsingular (Carrasco & Johnston, 2008).

The affine Hermitian curve, which is defined over finite fields (2b), is mathematically represented by the following Eq. 2 (Mohammad, 2017):

$$H(j,k,s) = j^{b+1}k^b + k$$

H (*j, k, 1*), which s-axis equal 1, when substation it in Eq. 1 (Mohammad, 2017):

$$H(j,k,1) = j^{b+1}k^b 1 + k1^b$$

where $1^b = 1$, that will get Eq. 2.

If all partial derivatives of the curve do not disappear at this point, the Hermitian curve should be smooth, or the affine points must be nonsingular, recalling that the Hermitian curve should be smooth or the affine points must be nonsingular. The curve is considered to be nonsingular or smooth if all points that fulfill it are nonsingular (Carrasco & Johnston, 2008).

These three partial derivatives (Mohammad, 2017) smooth, or nonsingular points on the affine Hermitian curve (j, k, 1):

$$\frac{\partial H(j,k,1)}{\partial j} = (b+1)j^b = j^b$$

$$\frac{\partial H(j,k,1)}{\partial k} = bk^{b-1}1 + 1 = 1^b$$

The only position on the projective Hermitian curve where all three partial derivatives disappear is (0, 0, 1), and this point does not satisfy Eq. (3) (Mohammad, 2017).

$$H(0,0) = 0^{b+1} + 0^b + k$$

$$\frac{\partial H(j,k,1)}{\partial 1} = k^b + bk1^{b-1} = k^b$$

The first partial derivatives (Mohammad, 2017):

$$\frac{\partial H(j,k,1)}{\partial j} = (k+1)0^b = 0^b$$

The second partial derivatives (Mohammad, 2017):

$$\frac{\partial H(j,k,1)}{\partial k} = b0^{b-1}1 + 1 = 1^b = 1, \text{where} 1^b = 1$$

The third partial derivatives (Mohammad, 2017):

$$\frac{\partial H(j,k,1)}{\partial 1} = 0^b + 0k1^{b-1} = 0^b$$

Over finite fields (2^b), the number of locations that fulfilled Hermitian curve H in Eq. (3) (Mohammad, 2017):

1. Compute $r = \sqrt{f} \in f = 2^b$.
2. Compute number of points $\#p = r^3 + 1$.
3. It's worth noting that we added one to step 2: the point at infinity. Hermitian curves, like algebra curves, have a specific point at infinity (*j, k, 0*).

3 Literature Review

Many researchers have recognized that IoT encompasses many concerns that need to be investigated in many ways, with a particular focus on security. As a result, many solutions have been proposed to address this problem. In Raza et al. (2012), the researchers suggested using the datagram transport layer security (DTLS) protocol with CoAP in order to supply end-to-end security in the internet of things. While the DTLS wasn't designed for constrained devices, it was designed for the internet, which is a heavyweight protocol that has a long header to suit a singular IEEE 802.15.4 maximum transmission unit (MTU). Thus, 6LoWPAN is utilized to pressure the header of the IP layer. According to that, the researchers suggested mechanisms to employ the compression abilities of 6LoWPAN to compress the header and the message of DTLS. The researchers defined many compression techniques that are related to their contribution, such as record header, handshake header, client hello message, and server hello message. One of the outcomes shown for the record header of the DTLS could minimize the number of bits by 62%. However, the researcher's study did not prove that compression does not impact security. According to that, the researchers (Kothmayr, 2011; Kothmayr et al., 2013) suggested a new solution based on RSA which energy consumption is high.

The researchers (Raza et al., 2013) proposed another resolution by using DTLS. The suggested solution was a combination between DTLS and CoAP for the internet. Moreover, it includes four main components; DTLS, CoAP, DTLS header compression (using 6LowPAN), and a CoAP-DTLS integration module that was improved to permit the application to access CoAP automatically. This solution is evaluated by using Contiki OS, which uses actual sensors. The evaluation results show the essential gains in the network response time and power consumption by decreasing the packet size. Thus, they could reduce the number of fragments or avert them by utilizing compression in case the payload was a little above the threshold.

The researchers (Brachmann et al., 2011) illustrated two main issues that required to be resolved to secure the communication links; secure group communications that aim by using DTLS to establish a secure connection for the collection of devices, and end-to-end security purpose is to perform a fully secure communication among HTTP and CoAP by using 6LoWPAN border router and DTLS-PSK protocol.

In Alghamdi et al. (2013), the researchers presented an analysis of two well-known protocols that could be used to increase security in CoAP networks. These protocols are DTLS and IPSec. The analysis was based on the architecture of X.805 standard that supplies a top-down method to do the following; edit, predict and discover the security vulnerabilities in the network. In addition, the researchers mentioned that these protocols weren't designed and transacted for constrained devices. In comparison, the researchers in Ukil et al. (2014) suggested a lightweight approach by using an advanced encryption standard (AES) which is 128 bits symmetric key algorithm, which came up with the Auth-Lite approach that becomes the lightweight security for CoAP. However, the suggested process is applicable in vehicle tracking systems but may or may not be efficient and valuable for other applications.

In Bhattacharyya et al. (2015), many solutions were presented by the researchers depending on the idea of session security. The researchers used the Lightweight Establishment of Secure Session (LESS) algorithm in CoAP and the DTLS-PSK channel encryption method. Theory communication and message exchange LESS algorithm is used to protect the session key since it uses the AES-CCM encryption technique. Moreover, the algorithm separates the key to ensure secure communication. The DTLS algorithm includes six main steps; pre-sharing secret, session initiation, server challenge, client response and challenge, client authentication, and server authentication. The analysis of one study shows that DTLS is more reliable since it uses six steps rather than request/response in LESS, and each step in DTLS may have multiple messages. However, the researchers' solution is applied for unicast security only, not to multicast security issues.

4 Proposed Algorithm

In this section, a proposed algorithm is described, which its main goal being to secure communications between different objects in IoT networks that are connected with each other. The Hermitian-based Cryptosystem (HBC) method (Mohammad, 2017), which is based on AG code over Hermitian curve, is employed in this study. Hermitian curve can create a huge number of points in a curve which plays a significant role in generating encryption keys. In addition, that its main employment in this technique is to generate private and public keys based on (Mohammad, 2017). Moreover, HBC can perform data encryption in addition to error correction, which is another advantage compared with other algebraic geometric code methods.

As shown in Fig. 3, HBC (Hermitian Based Cryptosystem) is applied to CoAP protocol located in the application layer. HBC is based on an algebraic geometric curve, Hermitian Curves (HC). Moreover, it inherits all advantages and characteristics of HC, whose main significant characteristic is the number of points that can be generated. Thus, it plays the primary role in generating a massive size of encryption keys and defining the size of the plaintext message. Moreover, HBC has three main functions; keys generation, encryption, and decryption. Keys generation includes public and private keys; a public key is employed to encrypt a message, while a private key is used to decrypt the same message. In HBC, three types of private keys, Q, I, and G (Mohammad, 2017), are used to compute the public key by the following Eq. 4 (Mohammad, 2017), as illustrated in Fig. 4.

$$Kpub = G * I * Q$$

As shown in Fig. 5, the main inputs for the encryption algorithm are plaintext which denotes by M and a public key that indicates to *Kpub*, which is selected

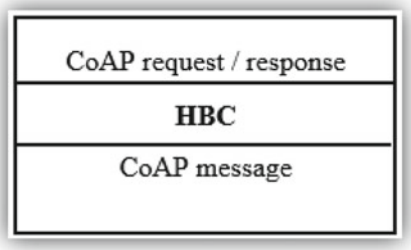

Fig. 3 General model of suggested work

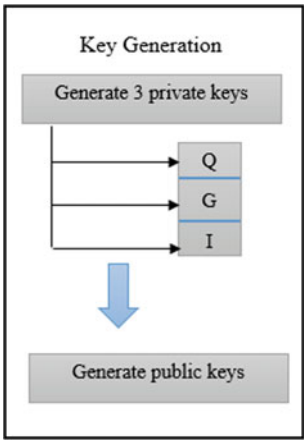

Fig. 4 Keys generation (Mohammad, 2017)

randomly from many keys that are generated by Eq. 4. In addition to that; by applying the public key on the message that will be sent, ciphertext (C) is created as presented in Eq. 5 (Mohammad, 2017).

$$C = M * Kpub$$

In turn, as presented in Fig. 6, the decryption algorithm has ciphertext (C) as an input that is transmitted from the sender to the receiver. As shown in Fig. 6, this algorithm has three main steps; compute D, Z, and P. Where D is calculated by applying Eq. 6 (Mohammad, 2017) to eliminate the effect of the permutation matrix form the C. While Z indicates to error detection and correction on D. Finally, Plaintext denotes as P, which is the original message sent by the sender after the decryption process.

$$D = C \times Q - 1$$

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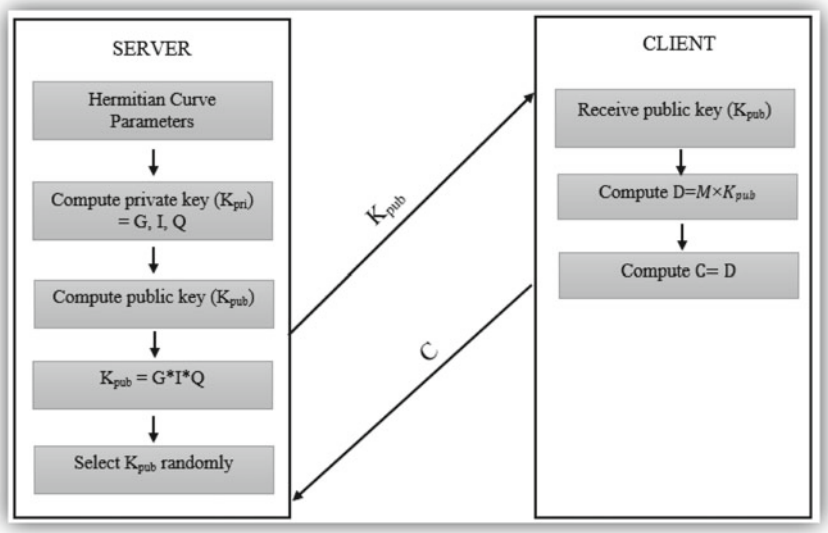

Fig. 5 Encryption algorithm in CoAP (Mohammad, 2017)

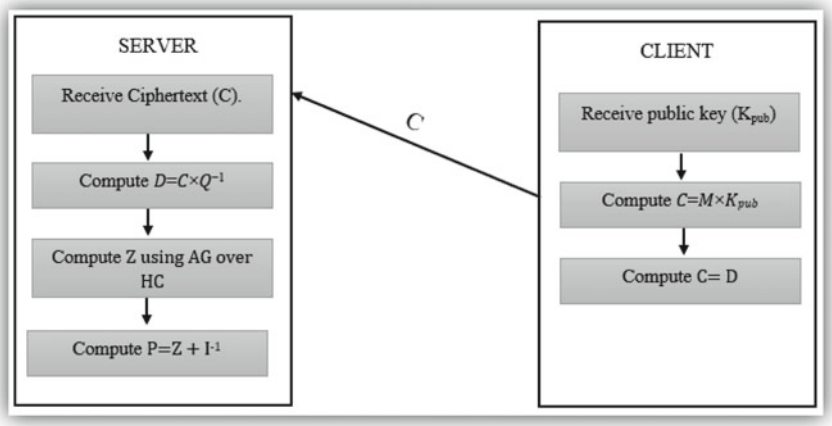

Fig. 6 Decryption algorithm in CoAP (Mohammad, 2017)

5 Simulation Results

This study presents the average running time results of the encryption and decryption processes for various message lengths. Moreover, the proposed work is compared with other cryptographies applied on CoAP, such as Elliptic Curve Cryptography

(ECC) (Asif, 2016; Ganesan et al., 2008) and Reed-Solomon code (RS) (Alzubi et al., 2016; Lee & O'Sullivan, 2010) in terms of the number of points and key size.

As transparently shown in Fig. 7, the average running time of the encryption process increases by increasing the message length and the finite field. In addition, the running time includes the keys generation, encrypting the message, and the transitions of a message. At the same time, the decryption process consists of the message decryption process. Thus, the average running time of the decryption process increases with the message length but is less than the encryption running time, as shown in Fig. 8.

To generate a strong and long key in cryptography, the number of points on the curve has a high and direct effect. Thus, calculating the number of points over the Hermitian curve based on the chosen finite field is the same as the RS code, which

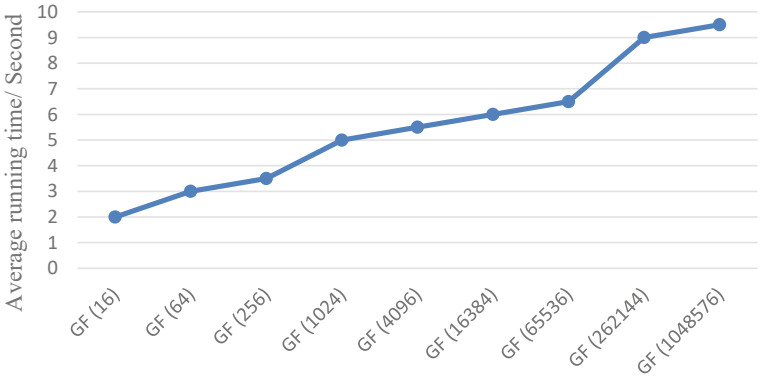

Fig. 7 The average running time of encryption process for various finite field

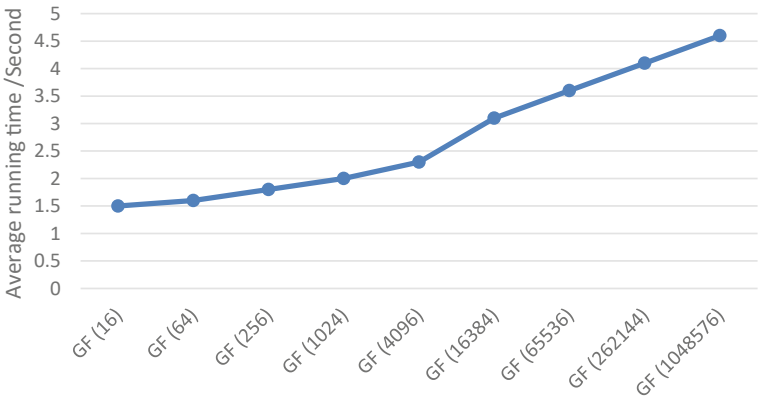

Fig. 8 The average running time of decryption process for various finite field

contrasts ECC. The number of points over HC depends on the selected finite field, while EC is computed by applying the following Eq. 7 (Blake et al., 1998). However, RS is calculated by using Eq. 8 (Johnston & Carrasco, 2005).

$$\neq P = (w-1)(w-2)\sqrt{q} + 1 + q$$

$$\neq P = q2 - 1$$

where the number of points denotes as P, w indicates to the code length and q indicates to the characteristic of the finite field for instance filed.

It is evident in Table 1 that HC is more secure than EC and RS because it can generate many points compared to them. In other words, the number of points that satisfied the HC are significantly increased, especially when choosing a higher field compared to the slightly raising in both EC and RS, as shown in Fig. 9. Thus, applying the Hermitian curve to COAP will increase the security. For instance, GF (22^0) can generate 1,073,741,824 points which satisfies HC, while EC can generate 1,050,625 points and RS can generate 262,143 points.

Depending on Fig. 10, it is obvious that the public key length of HC is larger than the other key length of both EC and RS, which leads to being more secure and more complicated to decrypt the message. Thus, two main reasons to increase the complex message decryption; are the extensive length of the public key and each point represented in non-binary.

Table 1 Number of points for Hermitian curve compared to RS and EC for various GF (2^b)

$GF\ (2^b)$	Number of points for Hermitian	Number of points for Elliptic	Number of points for RS code
$GF\ (2^2)$	9	9	3
$GF\ (2^4)$	65	25	15
$GF\ (2^6)$	513	81	63
$GF\ (2^8)$	4097	289	255
$GF\ (2^{10})$	32,769	1097	1023
$GF\ (2^{12})$	262,145	4225	4095
$GF\ (2^{14})$	2,097,153	16,384	16,383
$GF\ (2^{16})$	16,777,217	66,149	65,535
$GF\ (2^{18})$	134,217,729	263,169	262,143
$GF\ (2^{20})$	1,073,741,825	1,050,625	262,143

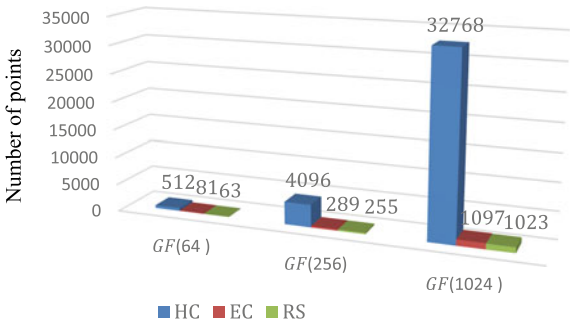

Fig. 9 Number of points that satisfy HC, EC and RS

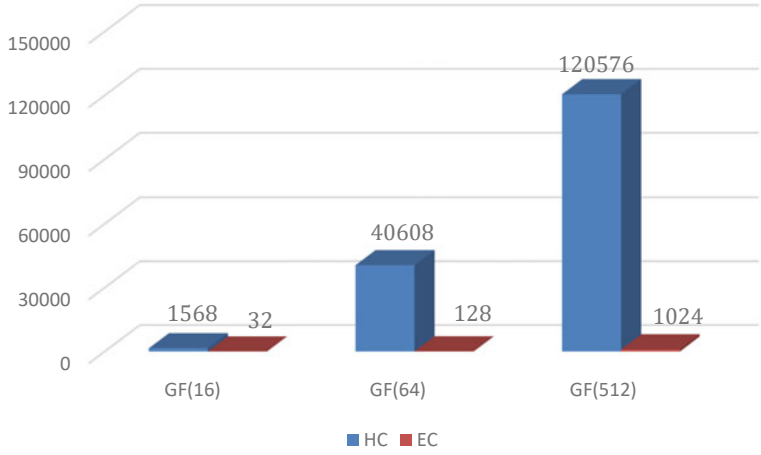

Fig. 10 The public key length for HC, EC and RS

6 Conclusion

This study proposed a new solution based on AG codes over the Hermitian curve to solve the central issue of IoT, which is security, by applying this algorithm to the CoAP protocol. The Hermitian curve can generate a maximum number of points on the curve that plays a crucial role in creating the encryption key compared to the other types of AG curves, such as the EC and RS. This work proved that the suggested solution outperforms RS code and ECC in terms of key length and the number of points which indicates the number of generation keys. However, the drawback of this algorithm is the power consumption.

As a future direction, a new solution will suggest decreasing the power consumption, preserving the security, or increasing it by employing metaheuristic optimization algorithms such as (Alzaqebah et al., 2019; Masadeh et al., 2019).

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Effectiveness of Introducing Artificial Intelligence in the Curricula and Teaching Methods

Hani Yousef Jarrah, Saud Alwaely, Saddam Rateb Darawsheh, Muhammad Alshurideh, and Anwar Saud Al-Shaar

Abstract This research examined educators' perceptions of the effectiveness of introducing artificial intelligence (A.I.) and expert systems into the curricula and teaching methods of higher educational institutions in the United Arab Emirates. Ninety-three faculty members in various departments of UAE colleges of education completed a questionnaire assessing the impacts of Artificial Intelligence on students' creativity, problem-solving skills, data were analyzed to identify differences based on gender, educational qualification, and experience. The results of t-tests and ANOVA analysis revealed that participants had overall positive attitudes toward introducing A.I. and expert systems into the curricula and teaching methods. Although no differences were found based on gender or experience, statistically significant differences were associated with academic qualifications, whereby participants with master's

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_104

degrees gave higher ratings than those with doctorates. Based on the findings, introducing A.I. and expert systems into higher education curricula and teaching methods is recommended.

Keywords Artificial intelligence · Expert systems · Teaching methods

1 Introduction

Artificial intelligence (A.I.) is an efficacious mechanism to deal with complex conditions (Claudé & Combe, 2018) and it is among the most rapidly developing multimedia educational technologies (Salloum et al., 2020a; Tripathi & Al Shahri, 2016). AI has two types: strong and weak. The strong one is supposed to emulate the function of brains of the humans but it is not created yet while the weak one is common in life of people and it comprises Natural Language Processing (NLP), Machine Learning (ML), Speech recognition, Machine vision, and Expert Systems (ES) (Al Claudé & Combe, 2018; Salloum et al., 2020b; Shebli et al., 2021).

The rate of use of Artificial intelligence and expert systems is proportional to the increasing number of courseware inventions among educational colleges (Amarneh et al., 2021; Nuseir et al., 2021). Adaptive learning courseware can be referred to as the technology requiring students to master the same objectives of learning. The adaptive software engine is responsible for determining timing and order of the content and it evaluates performance of the student based on a number of factors and after that the student is guided through the course content (Alhashmi et al., 2020; AlShamsi et al., 2021). Adaptive courseware is existed for many years ago but nowadays it is used in all of the education stages and professional development. And also, it is expanding to other branches like foreign languages, economics, physiology, anatomy, and business (Gebhardt, 2018; Yousuf et al., 2021).

Intelligent tutoring systems (ITSs) is a special genre of e-learning systems, where the operation of ITSs is based on making an emulation of the human teacher in the process of teaching and learning. The personal and portable characteristic of e-learning that appeared with the coming of the mobile computing system, put a key stone to the beginning of mobile intelligent tutoring. The aim of the Mobile intelligent systems (MITSs) is to adapt with daily routine of the mobile learners without any bad effect on their other activities. We should note that there are limited capabilities in improving the efficacy and potency of learning in case of handheld terminals. While in the non-portable ITS rivals, MITSs is considered agent-based systems as their tasks are achieved by agents (Glavinic et al., 2007).

Over the past 2–3 decades, the development of tools for multimedia technology-enhanced student learning has accelerated quickly to enhance the interactive capabilities of students as well as educators. Multimedia tools have immensely benefitted educational institutions across fields, fostering learners' problem-solving abilities and communication and thereby augmenting their creativity, imagination, and

cognition, as well as enhancing teachers' planning by providing insights into student aptitudes and learning processes.

NLP abilities and social intelligence embedded in A.I. give machines the ability to read and understand human languages as well as to adapt to different learning styles, aptitudes, and rates. Expert systems, which are a type of A.I. comprising software programs, have human influence approaches to problem-solving.

The following items: Human–computer interaction interface, interpreter, working memory, reasoning machine, and knowledge base constitute the essential structure of any expert system. The expertise of the expert system including rules and facts is stored in the knowledge base. Acquiring a new knowledge, storing and expressing knowledge in a trend that the computer can accomplish, should be enabled by the knowledge base in the stage of establishing a knowledge base. The facts in the working memory are matched with the knowledge by the reasoning machine and obtains new information. The storage unit should furthermore store the intermediate information gotten during processing. Explaining the outcome of the inference engine output, taking into consideration to interpret the cause and correctness of the conclusion is the responsibility of the interpreter (Tan, 2017).

It is worthy to mention that in the latest several years NLP has belonged to the most challenging areas. Analyzing of the education web pages and learning systems based on internet are in a need to the essential role played by the NLP techniques based on semantics and syntax of the natural languages (Salem, 2000).

The application of expert systems offers many advantages that support the educational process (Ghadirli & Rastgarpour, 2013). The chief benefit of an expert system is its ability to act as a "smart" teacher; thus, enabling independent learning outside of the classroom. The expert system also interacts with the learner by asking a set of questions and providing its conclusions in the form of diagnoses or suggested treatments. A similar process to the humanistic approach is to solve complex problems. A.I. and expert systems operate at a constant scientific and consultative level that is stable (Clement, 1992). This technology provides students with enjoyment that differs from traditional methods and introduces students' happiness and creativity in education, helping them to imagine all that is new.

The main objective of this study was to assess different perceptions on the effectiveness of A.I. expert system implementation on the curricula and teaching method in education colleges, a case of Colleges of Education in the United Arab Emirates.

Accurately, this research measured perceptions of faculty members at Colleges of Education in the United Arab Emirates (UAE) regarding the effectiveness of introducing A.I. and expert systems in the curricula and teaching methods on the students' creativity and the problem-solving ability.

The research questions relevant for this study include (1) how the Artificial Intelligence expert systems implementation has influenced the curricula and teaching methods of education colleges? (2) How does the implementation of the Artificial Intelligence systems in education colleges affect the creativity and the student's ability to solve problems?

2 Literature Review

2.1 The Meaning of A.I. and How It Works in Educational Colleges

There are various perspectives to view A.I., if we take for instance the business perspective, we can define A.I. as the combination of robust methodologies and tools used in solving the problems of business. And if we turn into the research perspective, A.I. is the interest of making computers replace humans in doing things that they do better nowadays (Brown & O'Leary, 1995) or AI can be defined as the mechanism interested in the creation and study of computer systems which shows some intelligence forms. We mean by intelligence as the system which can draw and reason valuable conclusions, learn new duties and conceptions about the world surrounding us (Rao et al., 1999).

A.I. refers to the aptitude exhibited by machines or software (Claudé & Combe, 2018), and the field of A.I. researches how to create computers and computer programs capable of intelligent behavior. Baker and Smith (2019) defined A.I. rather broadly as "computers which perform cognitive tasks, usually associated with human minds, particularly learning and problem-solving" (p. 10). As they explained, A.I. describes a range of technologies and methods, including machine learning, natural language processing (NLP), data mining, neural networks, and algorithms. Artificial intelligence systems execute tasks that usually need human intelligence, such as visual insight, speech recognition, decision-making, and translation between languages (Jewandah, 2018).

Accordingly, the A.I. field draws upon multiple disciplines, including computer science, information engineering, mathematics, linguistics, psychology, and philosophy. Based on the simulation of the human mind, A.I. technology has belonged to the science of algorithms and intelligent techniques based on replicating and understanding the archetype of the human psyche. The human brain sends signals to the body, which in turn controls all social processes and activities that occur daily, such as feeling, sensing, thinking, and movement. A.I. was introduced to emulate these processes and has had some success.

A.I. and expert systems have published several studies on the development across diverse areas such as medicine, chemistry, physics, engineering, education, training, manufacturing, and management (Tan, 2017). Furthermore, applications of AI nowadays expanded to finance, consumer products, medicine, and manufacturing taking into consideration that implementing of an adequate A.I. technique in an application should always be competitive. Knowledge-based systems (KBS) and expert systems (ES) are contributing deeply in numerous areas of decision making in industries such as production planning, advanced manufacturing processes, plant layout, materials, and purchasing (Rao et al., 1999). Claudé and Combe (2018) highlighted the effectiveness of A.I. as a tool for managing complex situations. A.I. and its branches of expert systems can address complex problems in record time, which accelerates the process of accumulating new knowledge by presenting the information in a manner

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tailored to learner's needs, thereby enhancing their reasoning skills and ability to conclude. Additionally, the A.I make the content easily memorizable by the students and make the work more comfortable for the teachers who prefer using them.

Jewandah (2018) emphasized that improvement and development in the A.I. industry would increase productivity for organizations at a lower cost And also, his results indicated that integration of the adaptive learning courseware as low-stakes assignments improves the outcomes of the students with a relatively modicum effort on both sides of the students and the instructor.

The inferencing system and the knowledge base are the two major parts of any AI-based education software. The knowledge base comes from procedures, theories, facts, and relationships which represent knowledge of the real world about people, events, objects, places, etc. while the thinking mechanism or the inference system is the technique of employing the knowledge base to resolve the complicated problems (Salem, 2000).

2.2 The Role of A.I. in the Achievement of Educational Goals

Information and communication technology (ICT) became an important part in the system of education for either completely replacing the teacher or just helping him in realizing a traditional lecture. E-learning is achieved between education on one hand and ICT on the other hand (Glavinic et al., 2007). Hence, the implementation of multimedia technology in higher education has been recognized as critical to maintain educational quality and achieve global competitiveness (Duncan, 2010; Popenici & Kerr, 2017a, 2017b; Warschauer, 2004).

In the future, the expert system may compromise applications which are more interactive, mobile, and intelligent that may blur the distinction between agents and expert system (Grove, 2000).

Mobile learning or m-learning is a subclass of e-learning and currently it is attracting high attention as it is the upcoming type of learning but the development of this type of ought to be achieved through evolutions of technologies related to wireless infrastructure like UMTS, GSM, and WiMAX. Utilizing of the previous infrastructure will help in making a network of mobile devices dedicated to the process of learning (Glavinic et al., 2007).

Accordingly, countries with highly developed higher education systems are increasingly incorporating multimedia and mobile technologies as intrinsic elements of new "connected learning" networked economies. However, educators have only recently begun to explore the potential pedagogical opportunities that A.I. applications afford for supporting learners throughout their education (Zawacki-Richter et al., 2019). Many teachers are yet to understand the benefits of I.A. in schools. They have a limited understanding of its pedagogical uses and have many questions regarding how to integrate A.I. as a supportive resource (Hinojo-Lucena et al., 2019; Zawacki-Richter et al., 2019). A.I. can impede students' imagination and learning self-efficiency if not applied to the university curriculum in a creative and

balanced manner. As a result, the students may complete courses and graduate without enhancing their level of performance, development, and innovation.

Expert systems, such as hardware, software, and knowledge engineering, have a statistically significant impact on the quality of decision-making. This was confirmed by Rafeeq (2015), who established that A.I. applications could provide substantial assistance to employees in the completion of their tasks because of their superior ability to perform tasks perceived as painful.

Al-Bishtawi et al. (2015) underscored the importance of expert systems in banks in facilitating electronic audit procedures such as swiftness in task execution and obtaining necessary data and information. A.I. enhanced the efficiency and quality of the audit by saving effort, time, and costs allocated to the implementation of the audit procedures and plan.

2.3 Expert Systems as Educational Tools

The technology of expert system firstly was created in 1960 but the origin of development in this branch of research go back to the concept of production system two decades earlier. In the current days, there are a considerable number of expert system obtainable on the internet containing applications in science, medicine, and industry (Grove, 2000).

Expert systems—the most notable applications of A.I.—transfer the logical processes of the human mind and present these consistent processes through a machine. Khanna et al. (2010) defined expert systems as a computer application that resolves efficiently the complicated issues that need vast human experience; it simulates rational thinking using precise knowledge and interfaces. Additionally, these systems employ human expertise to solve the problems that usually require human intelligence.

Expert systems have an immense capacity to carry out tasks, have access to rare human knowledge and expertise, and seek to preserve it and facilitate their use in specific areas by applying multiple perspectives to identify appropriate solutions to complex problems (Al-Maroof et al., 2021; Wan Ishak et al., 2010). Expert systems can provide solutions, answer questions, or provide advice at similar to or higher levels than that provided by human experts in the same field (Leo et al., 2021; Lucas & Van Der Gaag, 1991). In this way, users can exploit their insights and experiences using the analytical and data retrieval powers of the system (Al-Hamad et al., 2021; Keen, 1980). The teaching processes employed by expert systems include dynamic and rational training, and they play a critical role in enhancing teaching so that both teachers and students become interested and engaged in the learning process (Nazir et al., 2021; Sultan et al., 2021). These processes can then be used in educational curricula to promote and improve students' performance by fostering creative skills such as thinking, imagination, and cognition (Alshurideh, 2014; Alshurideh et al., 2021).

The study of Stella and Madhu (2017) emphasized the promotion of an expert system in the Nigerian educational system, finding that the tool provided great assistance for repeated study and understanding. Organizations can lose more of their useful problem-solving and analytical capabilities if A.I. technology and expert systems get neglected. Hassan (2010) identified the uses and efficacy of A.I. in libraries, finding that librarians' insufficient knowledge of artificial intelligence affected their understanding of any type of practical application in libraries and how to extract knowledge and use it in information bases in expert systems in libraries.

Using of internet grows continuously and additionally, the wireless communication supports the portability of internet access. Hence, the internet-based expert systems are available for accessing everywhere in the world at the needed locations (Grove, 2000).

2.4 Expert Systems as Educational Tools

The success or failure of educational technology use is highly dependent on teachers' attitudes toward technology. Teachers' technology self-efficacy is a critical factor in attitudes toward educational technology and the propensity to utilize it. Some studies have indicated that men tend to have higher computer self-efficacy than women (Koch et al., 2008; Ong & Lai, 2006; Sieverding & Koch, 2009) which can affect their attitudes towards its usefulness for education. The study of Wong et al. (2012)found that the effect of computer teaching efficacy on perceived value and attitude toward computer use was significant for female student teachers but not for their male counterparts.

Several studies have applied technology acceptance models (TAM) to assess teachers' perceptions of the usefulness, ease of use, and attitudes toward technology use and education in the classroom (Wong et al., 2012). The study of Wong et al. (2012)found that their TAM model accounted for 36.8% of the variance in intention to use computers among student teachers, and significant differences were identified based on computer teaching efficacy and gender.

Regarding the use of educational technology in Southeast Asia and Serbia, respectively, other researchers have used different measures to evaluate teachers' attitudes toward technology. Some studies have reported more positive attitudes towards technology among males than females (Chou et al., 2011; Durndell & Haag, 2002; Durndell et al., 2000; Kay, 2009; Kesici et al., 2009; Ong & Lai, 2006).

Cai et al. (2017) meta-analysis of gendered attitudes toward technology use revealed that males tend to hold more favorable attitudes toward technology use than females. However, some studies have found the opposite (Chou et al., 2011; Johnson, 2011; Price, 2006), and others indicate no significant differences (Imhof et al., 2007; Teo et al., 2015, 2016). For example, the studies of (Teo et al., 2015, 2016) examined pre-service teachers' perceptions and found no significant differences based on gender.

Table 1 Distribution of the study sample

Variable	Categories	Frequency	Percentage
Gender	Male	55	59.1
	Female	38	40.9
	Total	93	100.0
Educational qualification	M.AMA	40	43.0
	Ph.D	53	57.0
	Total	93	100.0
Experience	<5 years	10	10.8
	5–10 years	44	47.3
	>10 years	39	41.9
	Total	1093	10.8100

3 Method and Procedures

3.1 Population and Sample

This study used the survey method to collect quantitative data using questionnaires. Random sampling identified 93 faculty members from the college of education in 5 UAE Universities. To gather the whole sample from the population of the five UAE universities using the simple sampling technique, 15–17 faculty members were selected from each university. Data collection occurs during the second semester of the academic year 2018/2019. Table 1 presents a summary of the participants according to gender, educational qualification, and years of experience.

3.2 Instrument

Data was collected using a two-part tool. The first part collected primary socio-demographic data (gender, educational qualification, and experience). The second part comprised 25 questions measuring faculty's perceptions of the effectiveness of the introduction of A.I. and expert systems in the curricula and teaching methods of university education colleges. A five-point Likert scale scored the responses. The case ranged from 5 = completely agree to 1 = disagree.

The questionnaire was presented to a group of arbitrators to ensure its reliability. After an initial review, some paragraphs got deleted, new sections added, and others modified. The Cronbach's Alpha coefficient used to verify the scale's stability and internal consistency calculated resulted in a high value of 0.932.

3.3 Statistical Processing

Frequencies and percentages of personal information, arithmetic averages, and standard deviations of questionnaires are used for developing questionnaire paragraphs. An independent-sample t-test is applied to variables with two categories and analysis of variance (ANOVA) is used in analyzing variables with more than two groups.

4 Results

Table 2 presents the means and standard deviations of the questionnaire responses. Regarding RQ1 ("How do faculty assess the effectiveness of introducing A.I. and expert systems in the curricula and teaching methods of university education colleges?"), the findings indicate above-neutral attitudes among faculty with means ranging between 3.48 and 4.26. The lowest scoring items related to A.I.'s ability to help in developing students' perception and imagination (item 4), giving students the ability to manage difficult and complex situations (item 7), and to creatively solve problems presented in the absence of complete information (item 5).

Regarding RQ2 ("Does the effectiveness of introducing A.I. and expert systems in the curricula and teaching methods of university education colleges vary according to variables such as gender, educational qualification, and experience?"), independent-sample t-tests and ANOVA were applied to measure differences between means depending on the gender, educational qualification, and experience. Table 3 presents the results of a t-test analyzing differences according to gender. Although female faculty considered A.I. to be more useful and practical than their male counterparts, there was no statistically significant difference between assessments based on gender.

Table 4 summarizes the results of the t-test assessing differences in faculty perceptions according to academic qualifications. There was a statistically significant difference in faculty's understanding of A.I., whereby participants with master's degrees more commonly assessed the use of such technology as useful and practical ($t = 2.457$, $p < 0.05$).

The degree of freedom has calculated using the formula of (n–1) where n is the sample size. Therefore, there are 39 degrees of freedom for *MA* and 52 degrees of freedom for a Ph.D.

As shown by Table 5, an ANOVA found no statistical difference between participants' perceptions of AI-based on teaching experience.

5 Discussion and Recommendations

This study used a questionnaire to assess UAE faculty members' attitudes towards the usefulness and effectiveness of A.I. in enhancing learning. Although overall, the

Table 2 Summary of questionnaire results

No	Item	Mean	SD
1	Introducing artificial intelligence (A.I.) and expert systems into the university curricula increases students' creativity and performance	4.26	0.71
2	Introducing A.I. and expert systems into the university curricula enhances students' ability to think creatively	4.24	0.79
3	Introducing A.I. and expert systems into the curriculum helps students to respond quickly and creatively to new situations and circumstances	4.05	0.77
4	Introducing A.I. and expert systems into the curriculum develops students' perception and imagination	3.48	0.97
5	Introducing A.I. and expert systems into the curriculum helps students to solve in a creative manner the problems presented in the absence of complete information	3.61	1.11
6	Introducing A.I. and expert systems into university curricula increases the students' ability to discover knowledge creatively	3.82	1.06
7	A.I. and expert systems play a vital role in giving students the ability to manage difficult and complex situations	3.49	1.13
8	A.I. and expert systems in the university curricula increase students' pleasure during the lecture	3.94	0.94
9	A.I. in the university curricula increases students' ability to learn and understand based on past experiences	3.87	0.92
10	Introducing A.I. and expert systems increase the students' ability to develop creatively	3.75	1.00
11	A.I. and expert systems in the university curricula increase students' ability to understand and perceive visual matters	3.86	0.90
12	A.I. and expert systems increase the students' ability to innovate and renew creatively	4.00	0.94
13	Introducing A.I. and expert systems in the university curricula enhances students' creative skills	3.80	1.03
14	A.I. and expert systems in the university curricula creatively improve students' decision-making	3.95	0.88
15	A.I. and expert systems in the curriculum teach students the skill of interpretation	3.81	0.89
16	A.I. and expert systems help students to develop their performance	3.68	0.93
17	Introducing A.I. and expert systems in the university curriculum help students to creatively apply knowledge	3.67	0.78
18	A.I. and expert systems in the curriculum enable students to creatively present information	3.78	0.86
19	A.I. and expert systems in the curriculum help students to creatively carry out their assigned tasks	3.97	0.97
20	A.I. and expert systems in the curriculum help students to understand the information quickly	4.02	0.90
21	A.I. and expert systems help students to obtain timely and accurate information	4.14	0.90

(continued)

Table 2 (continued)

No	Item	Mean	SD
22	Introducing A.I. and expert systems in the university curricula enable students to keep abreast of technological developments	3.96	1.03
23	A.I. and expert systems help students to choose the best alternative	4.12	0.78
24	Introducing A.I. and expert systems in the university curricula increase productivity of the student	4.12	0.95
25	Introducing A.I. and expert systems in the university curricula enhances student intelligence	3.89	0.90

Table 3 Test Results for independent sample *t-test* to detect variances by gender variable

Gender	N	Mean	SD	t	df	P
Male	55	3.870	0.554	−0.423	54	0.673
Female	38	3.921	0.601		37	

Table 4 Differences in perception based on academic qualifications

Degree	N	Mean	SD	*T*	Df
MA	40	4.055	0.477	2.475	39
Ph.D	53	3.767	0.609		52

Table 5 Results of an ANOVA measuring difference based on experiences

Variance source	Sum of squares	Df	Mean square	F	p
Within groups	1.535	2	0.767	2.425	0.094
Between groups	28.482	90	0.316		
Total	30.016	92	1.083		

participants reported that A.I. and Expert systems to be a useful tool in fostering students' innovation and creative thinking, the lowest scores were related to the role of A.I. and expert systems in developing students' perception and imagination (item 4), providing students with the ability to deal with complex cases (item 7). Faculty also had somewhat less confidence in the capacity of A.I. to assist problem-solving in the absence of complete information (item 5). Claudé and Combe (2018) described A.I. as a useful tool for managing complex situations; however, finding of this study indicates the limits of A.I. and the continued need for teachers to help in guiding students to address complex problems and obtain the necessary information to solve them. A study on the use of intelligent information systems in biomedical education highlighted the importance of students' use of search engines, bibliographic websites and library resources to support their research (Aparicio et al., 2018). Zawacki-Richter et al. (2019) meta-analysis demonstrated that the faculty used A.I. tools

to provide teaching content to students, it was generally combined with support by giving feedback and hints on how to solve questions related to the content, as well as detecting the difficulties/errors of students (Alsharari & Alshurideh, 2021; Alshurideh et al., 2019a, 2021).

The lack of significant difference in faculty perceptions of A.I. according to gender aligns with previous findings regarding the impact of gender on attitudes toward technology (North & Noyes, 2002; Teo et al., 2015, 2016; Imhof et al., 2007; Alshurideh et al., 2019a, b, c; Kurdi et al., 2020, 2020a, b)

In the context of the Arab Gulf region, there is a limited research on educators' attitudes toward A.I.; however, we can compare the results with findings on attitudes toward other educational technology tools. Al-Emran et al. (2016) found no statistical difference between male and female educators' perspectives, which they attributed to equal levels of use and experience. However, a large-scale study of educators at King Saud University. Alwraikat and Al Tokhaim (2014) found that female instructors' attitudes, towards mobile learning, were significantly more positive than that of male instructors. The study of Al-Hunaiyyan et al. (2017), which studied the impact of instructors age and gender differences in the acceptance of mobile learning, found that the younger instructors were more likely to accept the mobile learning compare to the elderly instructors. Additionally, the study of Alwraikat and Al Tokhaim (2014) study findings affirmed that female instructors were more favorable to mobile learning compared to male counterparts.

The lack of difference based on experience suggests that the participants are using this technology with a high degree of mastery regardless of experience. Therefore, they view the same impact on students after the inclusion in the teaching methods and curriculum. Teachers' performance and interaction are at the same level, despite their experience. Other studies in the Arab Gulf region similarly identified no differences in attitudes toward mobile learning based on the faculty members' expertise (Al-Emran et al., 2016; Eltahir, 2019). Gebhardt (2018), in the study on Adaptive Learning Courseware as a Tool to Build Foundational Content Mastery: Evidence from Principles of Microeconomics, also found that the use of the courseware promoted the student's mastery of concepts on the principles of Microeconomics.

Based on the findings, the researchers offer two main recommendations:

(1) A.I. and expert systems introduced into the curricula and teaching methods of university education college. The two have a significant impact on students' creativity and excellence return.
(2) Further research, similar to this study, must be conducted on applications of A.I. in higher education systems in developing countries, and different perspectives should have been explored. The reason for choosing this study is most of the developing countries are yet to embrace e-learning due to some limiting factors such as cultures, economy, and the level of technological development. For example, this study focused on teachers' perceptions of learning-facing tools, i.e., software that responds to students' needs and is used to receive and understand new information (Baker & Smith, 2019). Future research should examine

precisely how faculty members use A.I. to support students' learning and the level of acceptance of A.I. in educational colleges in developing countries.

This study has several limitations. First, the sample was limited to the college of education faculty rather than encompassing faculty across departments. Future studies can examine perceptions of A.I. educational technology across disciplines to evaluate if any differences can be related to educators' area of expertise. Future research can also incorporate additional variables such as age to measure teachers' perceptions, as well as measures of teacher self-efficacy and mastery of A.I. and expert systems.

Declaration of Conflicting Interest The author(s) declared no potential conflicts of interest concerning the research, authorship, and publication of this article

Funding The author(s) received no financial support for the research, authorship, and publication of this article.

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A Roadmap for SMEs to Adopt an AI Based Cyber Threat Intelligence

Abhilash J. Varma, Nasser Taleb, Raed A. Said, Taher M. Ghazal, Munir Ahmad, Haitham M. Alzoubi, and Muhammad Alshurideh

Abstract Cybersecurity has started to become the most significant concern among organizations as the number of threats and criminal activities in the past decade has increased exponentially. Cybercriminals and their attacking techniques have become increasingly sophisticated over the past couple of years. Conventional security measures will no longer be able to detect and mitigate the propagation of such advanced attacking trends. More and more hackers have started focusing on Small and medium-sized enterprises (SMEs) taking advantage of their limited resources. Therefore, SMEs will have to quickly adopt Artificial Intelligence (AI) based cybersecurity system in their infrastructure to defend themselves effectively and efficiently. It is currently forecasted that by 2021, 75% of all organizations will use AI and Machine learning (ML) applications in their security architecture to protect against all cyber threats. In this paper, the researchers identify the various challenges faced by SMEs in

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_105

adopting an AI based cybersecurity due to their knowledge gap and lack of expertise. The researcher intends to provide a good background on AI, Cyber Threat Intelligence (CTI) and highlight some of the significant benefits provided by an AI based CTI system. A simple roadmap is developed using a qualitative research methodology to help SMEs effectively implement an AI based Cyber Threat Intelligent system in their infrastructure.

Keywords Cybersecurity · Artificial intelligence · Machine learning · Cyber threat intelligence · Deep learning · AI · ML

1 Introduction

Cyberattacks have increased exponentially over the globe. The world-famous investor Warren Buffet sees cyber risk as one of the gravest threats to humanity. In the past decade, we have seen some of the largest data breaches, national level hacking activities, political manipulations, and the use of botnets to bring down major telecom industries (Alzoubi et al., 2021a, b). These are compromising our private, professional, and national existence. No industry or organization is now completely safe from a cyber threat and therefore, the security professionals are always expected to stay current and up to date on the latest attack trends and vulnerabilities used by hackers (Kashif et al., 2021). They must detect, analyze and protect the organization in real-time (Alshurideh, 2022; Alshurideh et al., 2022a, b). Alkhalil et al. (2021) mentioned that the global cost of cybercrimes is expected to reach USD 6 trillion by 2021; 43% of the total cyberattacks target small businesses; $3.9 million is the average cost of a data breach for small to medium size businesses; organizations usually take nearly 6 months to detect a breach; the number of connected IoT devices will reach 75 billion by the year 2025 (Alnuaimi et al., 2021a, b).

Cyber threat intelligence is a process that proactively and iteratively searches various systems, databases, networks (Farouk, 2021), and other resources to detect and educate itself about the changing cybersecurity threats that can evade existing security controls. It enables the cybersecurity professionals to quickly recognize indicators of cyberattacks, analyze the attack methods and respond in a timely manner (Ali Alzoubi, 2021a, b). The cyber threat intelligence helps organizations to isolate and remedy these advanced threats before a cyber threat occurs. Even though various cyber threats follow different methods of cyberattack, they have a similar life cycle starting with the victim reconnaissance to performing malicious activities on the victim's network\devices (Mondol, 2021). The primary purpose of Cyber threat intelligence is to detect all weak points in the existing security solution and thereby take the necessary actions to safeguard the organization (Al Ali, 2021).

Over the years, Cyber Threat Intelligence has evolved from small ad-hoc tasks to a much more powerful program with their own dedicated staff, tools and processes that can support the entire organization (Radwan & Farouk, 2021). Most organizations nowadays not only consume cyber threat intelligence but also produce them.

This shows the growing maturity, popularity and professionalization in this field (Lee, 2020). Without the help of advanced data mining techniques, ML and AI, it is practically impossible for cyber analysts to stay on top of the latest attack trends, analyzing the current attack logs, generating intelligent reports that can be used to share and report on cyber security (Al Kurdi et al., 2021; Alhashmi et al., 2020; Salloum et al., 2020). AI and ML systems can significantly support cyber analysts in early detection as well as providing timely recommendations for mitigating various threats (AlShamsi et al., 2021; Nuseir et al., 2021; Yousuf et al., 2021).

In this research, the researcher will be reviewing some of the existing literatures on AI and CTI, discussing their core processes, functions and development lifecycle (Akour et al., 2021; Almaazmi et al., 2020; Alshurideh et al., 2020a, b, c). One of the key issues identified in the literature review is that SMEs are currently lagging in adopting this technology in their infrastructure due to several challenges such as limitations in budget, expertise, knowledge, etc. This problem can be overcome if there is a roadmap that can help SMEs to plan and successfully implement an AI based CTI system (Al Al Suwaidi et al., 2021; Alzoubi et al., 2021a, b; Shebli et al., 2021). Thus, the aim of this research is to develop a simple, effective, customizable roadmap for SMEs. The effectiveness of the roadmap was evaluated using a qualitative analysis and based on this result, an updated, customized, and focused roadmap is finally presented by the researcher (AlHamad et al., 2022). The main advantage of this research would be that it will provide enough knowledge and the confidence for SMEs to go ahead with their investments in AI based cybersecurity and how to use intelligent AI based systems to protect the organization from the vast number of cyber threats in the modern technological environment (Lee et al., 2022a, b). The research also covers some of the main challenges and risks that are usually faced by SMEs as part of their adoption of AI based CTI system (Miller, 2021).

2 Literature Review

In recent years, there has been a significant increase in the number of cyberattacks faced by organizations. Traditional firewall and antivirus based cyber defense tools is now primitive and are no longer able to effectively block cyber threats or keep up with the rapidly developing threat vectors. Cyber attackers are developing new sophisticated AI based smart malwares that can understand the target system, learn their environment, evade detection, and make intelligent decisions making it more and more complex and challenging for the organizations to detect and defend against various cyber threats (Alzoubi, 2021a, b). It is practically impossible for cyber analysts and forensic investigators to keep up with the advanced number of threats, the amount of data to be analyzed and the speed of processes to actively respond to all cyber threats in real-time (Alhamad et al., 2021). Existing literature shows that even though there has been a significant increase in the number of organizations that have started to adopt AI based Cyber (Alzoubi & Aziz, 2021a, b). Threat Intelligence for their cyber defense, a vast majority of cyber security professionals still lack a

deep understanding of Cyber Threat Intelligence, how AI based algorithms work and most importantly how to secure and harden an AI based CTI system (Ali et al., 2021). This is mostly because AI based CTI systems are not mature yet and is still an evolving technology (Alshurideh et al., 2020a, b, c). Large enterprises have the luxury of higher budget to invest in the latest innovative solutions, infrastructure, resources and for acquiring the required knowledge and expertise. Small and Medium sized Enterprises (SMEs) do not have this luxury and often struggle to invest and implement such new technologies in their infrastructure (Alshraideh et al., 2017; AlShurideh et al., 2019; Ghannajeh et al., 2015). SMEs therefore become most vulnerable to these advanced cyber threats as they are not kept up to date with the emerging cyber defense mechanisms (Alzoubi et al., 2021a, b).

Lee (2020) based on their latest CTI Survey, the biggest challenges faced by most organizations on the successful implementation of CTI are difficulties in integrating CTI with existing systems, the overall cost of implementation and continual improvements, lack of trained cyber security analysts and limited management support. Lidestri (2018) surveyed about 603 IT and IT Security professionals working for various US organizations who have already deployed or are planning to deploy an AI based CTI program in their organization. In this survey, while 71% of AI users voted that the AI technology will increase the speed of analyzing threats and providing a deeper security, only 60% of the current non-AI users believed this to be the primary benefit. 69% of the respondents believe that incorporating AI in Cybersecurity will increase the speed of analyzing threats while 64% believe it will help to quickly contain the infected endpoint (Ghazal et al., 2021). Cyber threat intelligence will increase the requirement for organizations to retain and employ more talented cyber analysts with AI exposure. This will bring a positive cybersecurity posture. Based on the survey, 68% of AI users said AI will improve the productivity of the IT staff while only 60% of non-AI users agreed on this. In one hand, 69% of AI users said that AI and ML technology will significantly improve the effectiveness of various application security activities, while on the other hand, only 59% of the non-AI users believed in this (Alzoubi & Yanamandra, 2020). The AI security experts\users believe that AI adaptation will help reduce the complexities in various security architecture. 56% of AI users responded that the adoption of AI based CTI system will decrease the overall complexity of the organizations security architecture while only 40% of non-AI users shared this view (Lee et al., 2022a, b). As the AI maturity level increases in the organization, the cyber analysts become more capable in understanding and identifying areas where AI implementation would be most beneficial (Aasriya, 2021). The stability, knowledge and expertise of AI based threat detection is drastically expected to improve as more and more organizations start to incorporate it and invest in this technology (Alkalha et al., 2012; Alnuaimi et al., 2021a, b; Altamony et al., 2012; Zu'bi et al., 2012). While non-AI users believe that an AI based CTI system will help them detect 41% of the previously undetected zero-day exploits, the AI users responded that they are able to detect 63% of these exploits with the help of AI (Lidestri, 2018).

With the boom of the Internet of Things (IoT) and cloud computing, the SMEs have become heavily dependent on the cyber world and therefore need to adopt the

latest cyber forensic investigation techniques on exchanged and stored data (Singh & Singh, 2021). The growing attack surface includes amateur threats, such as phishing, sophisticated distributed denial of service attacks and skilled nation-state actors. Prevention is nearly impossible. Advanced persistent threats show that hackers are patient (Lee & Ahmed, 2021). Given enough time, attackers will be able to get in since the cost of an attack is low and automated probing will eventually find a weakness. ML, Data mining and AI can quickly and efficiently detect any network abnormalities, including static and dynamic malware attacks. They can quickly analyze, learn and act intelligently against advanced cyber threats (Hanaysha et al., 2021a, b).

3 Background Information

3.1 Artificial Intelligence (AI)

AI was explained as the science and development of intelligent systems and programs that can understand human intelligence (McCarthy, 2007). Artificial intelligent systems are technologies that can gather or read data from their various inputs, learn from their environment and make autonomous decisions based on the intelligence acquired through their experience and knowledge (Hanaysha et al., 2021a, b). They can adapt to different situations and act independently without any human intervention. AI should be able to automate most of your repeatable tasks and in the long run make intelligent decisions on behalf of the cyber analysts (Ahmed et al., 2021; M. Alshurideh et al., 2020a, b, c; Harahsheh et al., 2021; Naqvi et al., 2021). This will include functions like planning, reasoning, training, problem solving, etc. It's a highly effective tool that can continually learn from internal, as well as external data and become a vital part of the cyber security infrastructure. According to Davies (2020), AI systems can include capabilities like Cognitive computing, ML, DL, Natural Language Processing (NLP), Computer Vision, Speech, RPA, etc. as depicted in Fig. 1.

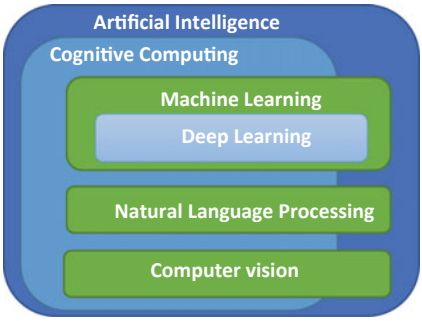

Fig. 1 Artificial intelligence

Cognitive Computing works with multiple subsets of AI such as ML, DL, NLP, Computer vision, etc. to simulate the human thought process and provide recommendations to help humans make better decisions. **Machine Learning** is a subset of AI and it enables machines to interact with data, learn from them and probably make changes to the algorithm in response to the data received without the need to follow explicitly programmed instructions (Alshurideh et al., 2022a, b). It includes deep learning, supervised algorithms and unsupervised algorithms to support predictions, analytics and data mining. These algorithms are used to recognize patterns and anomalies in data. Deep learning is a subset of ML. **Natural Language Processing** is a subset of AI that enables machines to work with text and languages, extracting their meaning and generating texts that are natural and grammatically correct (Ali et al., 2022).

3.2 Cyber Threat Intelligence (CTI)

Cyber threat intelligence is the final product that is disseminated after all cyber information is collected, processed and analyzed through a rigorous procedure called the intelligence cycle. It enables organizations to collect the correct threat intelligence and create a secure plan to detect, respond, prevent and mitigate various types of cyber threats and strengthen the organizations defense (Alzoubi et al., 2020a, b, c, d). The data should provide accurate useable intelligence. Figure 2, shows the various phases in the cycle.

According to Lee (2020), the Intelligence cycle starts with the Planning phase where the requirements are identified. This includes the specific questions and concerns that are to be addressed by the CTI program. Even though the requirements have a generic nature to all organizations, the specifications are unique to each

Fig. 2 The intelligence cycle. *Source* 2020 SANS CTI Survey

organization (Ahmad et al., 2021; AlMehrzi et al., 2020; Alzoubi et al., 2020a, b, c, d; Hayajneh et al., 2021). They are updated in an ad hoc manner based on the past incidents or upcoming trends in the industry. Specify who will be consuming the finished product—will it be used as an input to another system, will it be sent to Cyber analysts with technical expertise or will it be sent to top executives for their broad overview of the current cyber trends (Mehmood, 2021).

These requirements are then passed on to the Collection phase where they identify and evaluate the sources of intelligence that will help answer the requirements in an efficient manner. In addition to the inhouse data that is collected from the different departments\groups, information is also gathered from commercial threat feeds coming from CTI-specific vendors, generic security vendors, open-source threat feeds and forensics data (Alzoubi et al., 2020a, b, c, d). Information should also be periodically evaluated to ensure that it is current, effective and usable (Aburayya et al., 2020; AlShehhi et al., 2020; Svoboda et al., 2021). A data source that may have been critical in the past might no longer be needed, and new data sources might need to be identified as the organization and the threat landscape change (Alzoubi & Aziz, 2021a, b).

This data is then processed in the Processing phase to a format that is usable for the analysis phase (Alzoubi et al., 2022). Thousands of log events are generated every day by each system, these need to be collected, filtered and processed by automated systems to make any sense from the data. In the Analysis phase, the data is synthesized to support the requirements that were defined in the first phase. It searches for any potential security events and alerts the respective teams (Alzoubi & Yanamandra, 2020).

The final step is the Dissemination phase where the intelligence gathered is disseminated to the intended audience outlined in the planning phase. The data should go to the right recipient in the right format so that they are able to use it effectively. Timeliness and relevance are critical to the effectiveness of CTI dissemination. Cyber Threat Intelligence is primarily presented in the form of reports or brief summaries via emails, spreadsheets, power point presentations, etc. It is also used as an input to various security tools to generate alerts in an automated fashion (Alzoubi & Ahmed, 2019).

3.3 The Benefits of an AI Based CTI

Organizations generate and consume huge amounts of raw CTI data but it's incredibly time consuming and cumbersome to convert into intelligence. Most of these data is used for analyzing the application and its security (Alzoubi et al., 2020a, b, c, d). AI and ML programs can be the most beneficial for such tasks as they can analyze thousands of records\events, learn their behavior and raise an alert to the cyber analyst in case a vulnerability is detected (Alzoubi et al., 2020a, b, c, d). Semi-automation of cyber security tasks and data processing will be the golden standard followed by industries as the AI based CTI program maturity improves (Joghee et al., 2020).

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3.4 *The Core Functions of an AI Based CTI System*

Alnuaimi et al., (2021a, b) proposed the core functions of an AI based cyber threat intelligence as shown in Figure 3. *Identification* of threats and the vulnerabilities is key to understanding the risk a potential attack can have on the organization. AI and ML algorithms can *discover* abnormalities in behavior patterns, flag it immediately and alert the cyber security analyst of a potential breach or threat. AI can use its data sets to *detect* cyber threats by identifying common threat characteristics. It is important to *investigate* events to gather maximum amount of information about the attack, the attack vector, its status, exploits and vulnerabilities (Aziz & Aftab, 2021). *Analysis* would enable the security analyst to identify the vulnerabilities, the devices that were compromised, the elements that failed to prevent the attack and how it happened (Alzoubi & Ahmed, 2019). AI would enable the security analysts to respond in a timely manner and *prevent* any form of progression. AI would be able to immediately *respond* to threats and isolate the infected equipment and stop the threat from progressing any further. Deep learning and ML enable AI to learn the behavior of attacks and thereby *predict* when, how and where the attack will begin. This will enable the security analysts to take appropriate actions to better prevent or mitigate an attack before it happens (Akhtar et al., 2021). AI enables the organization to *continuously monitor* the cyberspace to discover new threats vectors as well as defend against known and unknown threats.

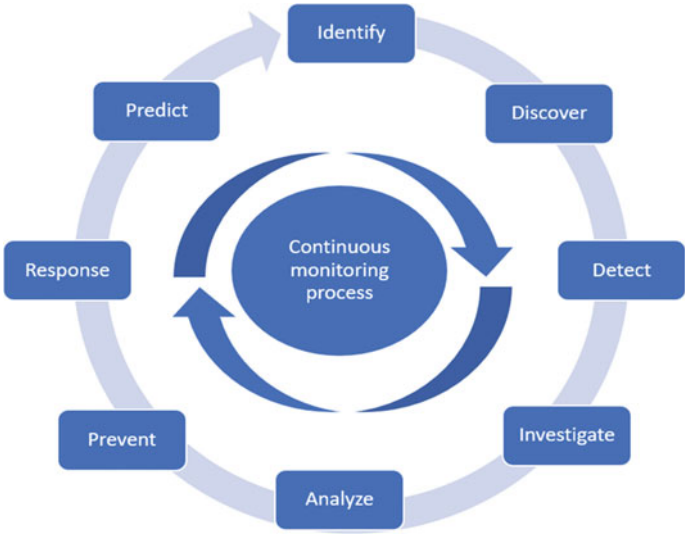

Fig. 3 Core functions of an AI based cyber threat intelligence

3.5 Designing an AI Based CTI system—The AI Development Life Cycle

Darraj et al. (2019) married the traditional SDLC with AI specific design and technology. Figure 4 depicts the 9 phases in the AI development life cycle: Planning, Analysis, Design, Implementation, Training, Optimization & Validation, Testing & Integration, Deployment and Maintenance. In the Planning phase, we need to clearly specify the Cyber threat intelligence requirements, its scope, security, access control, privacy and data encryption along with governance, laws and compliance (Emerita, 2021). In the Analysis phase, various cybersecurity AI tools are analyzed to identify the right tools, algorithms and data sets that are optimal for the organization. Here we will be able to decide which tasks can be automated and which needs a human intervention. In the Design phase, the AI based CTI solution is designed for the organization using the above identified AI tools covering ML, natural language processing, deep neural nets and cognitive computing (Khan, 2021). You will specify what will be the outcome and who will be using the system. In Phase four, the designed AI-CTI solution is implemented. In the Training phase, the designated data sets are used to train the AI-CTI algorithms for building its intelligence that will later be used for automation and taking intelligent decisions (Guergov & Radwan, 2021). In phase six, the cyber security analyst should optimize and validate the AI algorithm and data, ensure the cybersecurity hardening and patching are met and the system is functioning as intended. In phase seven, AI-CTI solution is integrated with the various systems in the organization and tested. The cyber security analyst starts testing the system ensuring all security and privacy requirements are completely met and confirm all PII, PHI, PCI/SOX and FTI data are appropriately protected (Obaid, 2021). In phase eight, the solution is deployed to production environment and becomes completely active. Here the cybersecurity analyst will continue hardening the system, patching and continuously monitor the AI-CTI solution. Phase nine is continual operation and maintenance of the AI-CTI system. The system, as any other application, needs to be continuously monitored and patched to ensure it meets expectations and requirements of the organization. We must make sure the AI system is behaving and functioning as planned. Threat forecasting and risk assessment should be performed at each phase considering the indicators of attack, compromise and interest. All vulnerabilities should be identified and remediated at each phase (Alnazer et al., 2017a, b).

3.6 Incorporating AI into Cyber Threat Intelligence

Learning can be defined as the process of acquiring knowledge or skill sets and when this knowledge is applied in a decision-making process it is called intelligence. An AI system must first learn before it can apply intelligence. To start off, AI systems can be used to perform daily repetitive tasks such as scanning, auditing, analyzing and reviewing huge volumes of data, logs and reports. It can perform

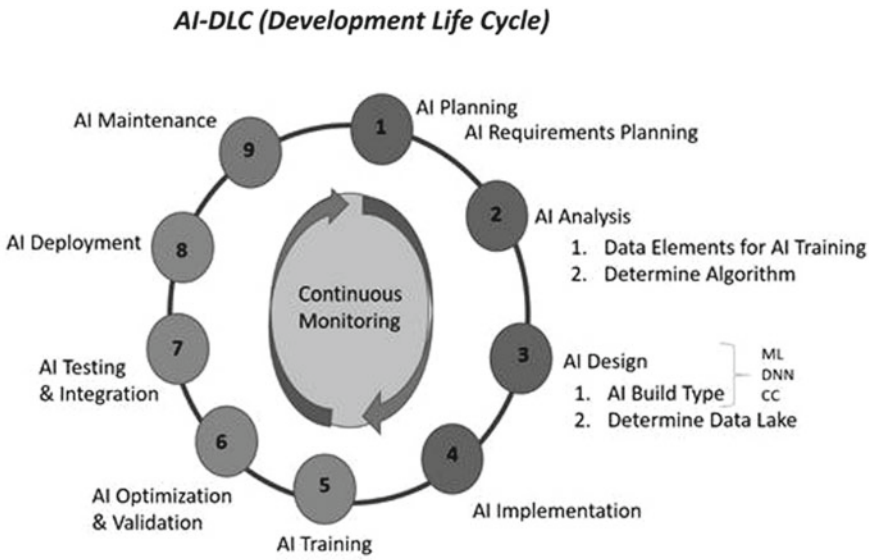

Fig. 4 An AI development life cycle

event correlation and generate intelligent reports which can then be further analyzed by the cyber analysts to strengthen the cyber defense system. AI allows to free up security operators so that they can now focus on more advanced tasks that require deeper thought processes (Alnazer et al., 2017a, b). There are several AI enabled tools and applications such as Neural Networks for intrusion detection, JASK security platform for detecting cyberthreats at its early stage, Cylance's security solution for predictive threat prevention, etc. to support cyber defense (Hamadneh et al., 2021). Adopting an AI based CTI system would improve the cyber resilience of the organization making its cyber defense strategy to be more proactive than reactive. The most significant feature of an AI based CTI system is its ability to adapt and learn. Overtime the system would be able to detect and respond to both known as well as unknown threats. Truong et al. (2020) categorized the most common applications of AI based cybersecurity into: Malware detection, Network intrusion and Phishing/Spam detection as illustrated in Fig. 5.

4 Research Design and Methodology

To address the research problem, the researcher has come up with a simple roadmap for SMEs that can help them to easily and effectively incorporate an AI based CTI system in their cyber security architecture. This roadmap was shared with some of the subject matter experts who are currently working in the cyber security team for various reputable organizations. This research is limited to the development of a

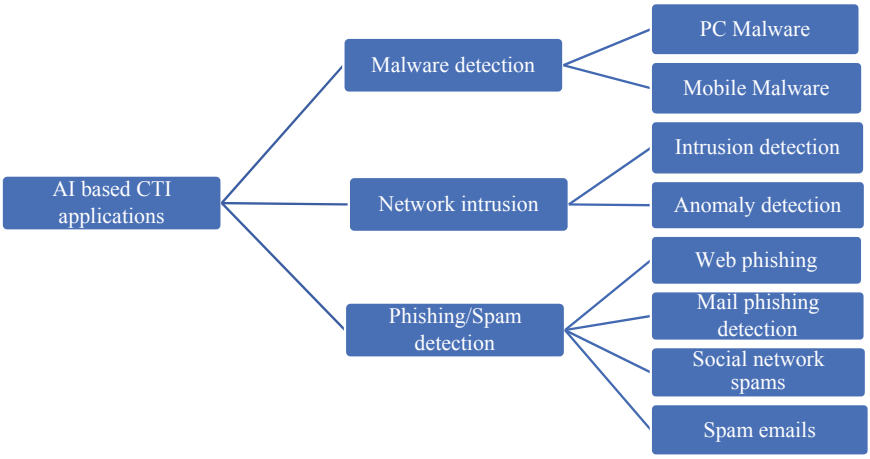

Fig. 5 Common AI based CTI applications

roadmap for SMEs for the successful adoption of an AI based CTI system as part of their cyber defense.

A qualitative research primarily deals with data which is verbal in the participants own written or spoken words based on his beliefs and understanding of the phenomenon (Bless et al., 2000). It tries to identify the problems that might be experienced by the participants with respect to the subject. The qualitative approach is appropriate for this study because the data collected and used focuses on the participants' subjective experiences in the field of organizational cyber security and the way they interpret them.

To evaluate the effectiveness of this roadmap we will be using a qualitative research method where the newly developed framework, as shown in Fig. 6 will be shared with various IT professionals. These participating IT professionals would be requested to evaluate the effectiveness, efficiency and the simplicity of the roadmap. The feedbacks from each of the participants are noted and used to develop our final roadmap for SMEs for the successful adoption of an AI based CTI system.

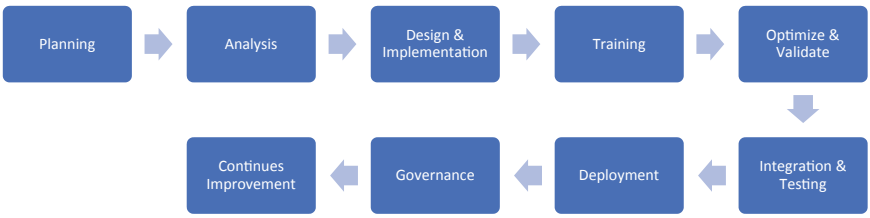

Fig. 6 A roadmap for SMEs for adopting an AI based CTI

1. Planning
    a. Setting up the requirements, scope, goals, security, access control, privacy, data protection, compliance.
    b. List of systems to be integrated.
    c. Create a team of experts with in-depth technical and process knowledge. Include SMEs from third party partners.
2. Analysis
    a. Identify the data platform.
    b. Evaluate data quality.
    c. Data collection (inhouse + external).
    d. Analyze various AI tools, algorithms, data sets.
    e. What tasks to automate.
    f. Tasks that need human interaction.
    g. Selecting the use cases that is easy to implement, provides a significant benefit, high impact to the cyber defense, high quality, complete, up-to-date data set that is readily available, has a with a very high impact.
    h. Look at some of the common use cases like malware detection, network intrusion detections and Spam\phishing detection.
3. Design and implement
    a. Designing the AI solution using the selected AI tools, algms, data sets identified from step 2.
    b. Specify what will be the outcome, who will be using it.
    c. Implement the solution in development environment.
4. Training
    a. Use pre-defined data sets to train AI to build intelligence.
    b. Exchanging and collaborating with other threat researchers and security professionals through various open-source threat intelligence platforms like Open threat exchange, Facebook threat exchange or IBM X-Force exchange is very critical for improving the efficiency and effectiveness of the AI algorithm in detecting new threats. Such collaborations help the AI solution to keep up to speed with the latest attack trends and vulnerabilities.
    c. Train cyber analyst for AI by upskilling their employees and improving their knowledge in the logic underpinning the AI algorithms and its behavior. Create proper interfaces that can enable them to interact with the AI tools and incident alerts.
5. Optimize and validate
    a. Fine tune the AI CTI for maximum efficiency and effectiveness.
    b. Ensure the AI CTI is functioning as intended.
    c. Continue patching and hardening.
    d. Assess the performance wrt initial requirements.

6. Integration and Testing
    a. Deploy Security orchestration, automation and response (SOAR) technologies to improve incident alert triage quality, defining a standardized incident response workflow, improving the security and operations management as well as reducing the onboarding time for a cyber analyst.
    b. Use SIEM to integrate the silos.
    c. Security and privacy requirements are met.
    d. Data is properly protected.
    e. Test the system thoroughly.
7. Deployment
    a. Deploy to production.
    b. Continue patching and hardening.
    c. Ensure the AI CTI is functioning as intended.
    d. Begin continues monitoring.
8. Governance
    a. A clear, transparent governance process needs to be implemented and adhered to monitor the performance of the AI-CTI solution. The controls should include checks on the roles and responsibilities, AI algorithm behavior abnormalities, risk tolerance, output verification and key performance indicators to measure the success of the program.
    b. Control processes to monitor the performance of AI CTI.
    c. BCP if the AI CTI stops working or goes rogue.
    d. It gives you the information you need to reduce Mean Time to Detect and Mean Time to Respond (MTTD and MTTR)—with a quicker, more decisive escalation process.
    e. It enables SOCs to assess and refine their IR processes, continually.
9. Continues Improvement
    a. Look at adding other tasks into the AI CTI.

The roadmap was sent via email to:

a. Senior Cyber Advisor working for a manufacturing company.
b. SIEM—Subject Matter Expert working for a reputed Information Technology and Service provider.
c. Director of Network, Infrastructure and Security working in the hospitality industry.

5 Findings and Results

5.1 Comments Received from the Senior Cyber Advisor

The road plan looks fab. It is really very impressive and efficient from what I understand. Great Job. I have some suggestions hoping they will be of some help.

Continual Improvement: I was expecting it from the planning phase itself. I was happy to see a heading in the end. I would recommend that every phase should have a clause of continual improvement. For instance, the processes defined need to be changed and improved with changing time. Our design needs to continuously evolve to better our product and its security. In the heading 9 itself we can say something of this sort in a couple of lines maybe?

Reviews and Approvals: Can we add some reviews and approvals? For instance, I would be more comfortable saying "reviewed and approved pre-defined data set" than 'pre-defined data set'.

One subheading, maybe a one liner somewhere about 'Segregation of Duties'?

5.2 Comments Received from the SIEM—Subject Matter Expert

Vulnerability assessment and Penetration testing should be used in the Planning phase for a better understanding of the current security infrastructure. This can be used to customize the solution for the customer. Getting to know the type of industry and customizing the solution accordingly for EG: Bank (SWIFT, PCIDSS), Healthcare (HIPPA etc.). Knowing the Number of users in an organization is important for the right sizing of Tools and devices. Use cases have to be custom tailored as per industry type of the organization. eg: create use cases for SWIFT application for banks etc. Providing Analyst with a Database for them to input information based on customer feedback after an incident is raised. Creating automated Templates in SOAR based on the incident triggered and for low-risk incidents automating the action using SOAR. For eg: IP is blacklisted, automatic action of blocking IP. Data should always be encrypted and make sure the main hardware is not connected to internet. Testing of the system should include PT or VA activity and detection of the threat. Tasks based on customer requirements and required less analysis by the Engineer needs to be automated. Further automation can be achieved but should have a final approval from Analyst before performing the actions.

5.3 Comments Received from the Director of Network, Infrastructure and Security

In the Planning phase, the company's mission, vision and executive management directions has to be analyzed. Based on these directions, the current security infrastructure must be reviewed and their setbacks to be noted. The AI based enhancements should be able to overcome these setbacks to gain the confidence and buy-in from the executive management.

Future research on various AI based cyberattacks by nefarious actors, their prevention and mitigation methods can further bridge the knowledge gap and secure the defense against such cyberattacks. The application of AI is a relatively new trend in combating cybercrimes and is still evolving. Further research should be conducted to improve the maturity of AI based cyber threat intelligence, their design, architecture and implementation. International Government bodies should also research and study how best they can legally cooperate and fight cybercrimes. The roadmap was evaluated and developed specifically for an SME; therefore, larger organizations might have added requirements to be addressed in the roadmap.

Considering the generic audience with backgrounds from different industries and having their unique requirement, we have restricted ourselves from discussing any vendor application or solution in detail. This gives us the opportunity to create a general guideline for SMEs that want to develop their own AI based CTI application as well as helping them negotiate with third-party service providers to make an educated and detailed blueprint to support their strategic decision on how they want to implement an AI based CTI system in their infrastructure.

6 Conclusion

Cybercrimes are increasing day by day and the attackers are using technologically advanced, complex and sophisticated threat models to evade detection. Adaptation of the various AI technologies have several benefits and can be used to detect and prevent attacks before it takes place. It is imperative that cybersecurity analysts have a deep and clear understanding of the AI algorithms, their functions and various possible applications to make the most of the cyber threat intelligence. The cyber analysts should ensure the AI systems are secured, hardened and continuously monitored to check and confirm they are behaving as expected, meeting all security/privacy requirements. More and more SMEs are acknowledging the need for an AI based Cyber Threat Intelligence to provide a secure and reliable cyberspace. It is critical that SMEs work together with larger organizations, Government, and other not-for-profit organizations to improve the current overall maturity of AI programs so that they become more dependable and less prone to going rogue.

The researcher believes that SMEs should start investing and adopting the latest AI based cyber security systems in their infrastructure so that they are all well prepared

and understand the nuances of future AI-powered exploitations and other attacking trends. This will also help in the continued research, development and maturing of the AI technology. With the help of this article, cyber security leaders would have gained the knowledge and confidence required for the successful implementation of an AI based cybersecurity system as part of its cyber defense and resilience program. Organizations can start off with the basic automation of daily repetitive tasks such as analyzing security logs, errors and reports for the Cyber analyst. Eventually, the AI applications scope can be increased to a broader set of more complicated cases to significantly increase the speed, efficiency, and effectiveness of their cyber defense.

7 Recommendation and Future Research

Even though there are several benefits in incorporating AI in CTI, very few SMEs have successfully implemented this in their infrastructure. There are several factors contributing to this, such as lack of expertise, lack of thorough knowledge about the algorithm behavior, its stability, cost of implementation, lack of awareness about the evolving cybercrimes, false positives, marketing hypes, etc. Due to these, SMEs often struggle to come up with a strong roadmap that would enable them to implement an efficient AI based CTI system. With the help of the qualitative analysis that was completed in this research, the researcher proposes the final roadmap, Fig. 7, for SMEs to develop their own customized AI based cybersecurity in their current security infrastructure.

Planning—In the Planning phase, based on the company's mission, vision and executive management direction, analyze the security infrastructure of the company using vulnerability assessment and penetration testing to understand the current risks. The AI based CTI system should be an enabler for the SME to achieve their strategic goals and should be able to mitigate the identified risks to gain the confidence and buy-in from the executive management. create a team of subject matter experts that include inhouse members with technical expertise, deep process knowledge as well as third-party partners. The third-party partners should be well experienced working with SMEs so that they can provide innovative solutions that are effective, optimized for SME requirements and are budget friendly. Specify the list of requirements, objectives and scope of the AI based CTI system. The specifications should also include information regarding the security, access control, privacy, data protection, encryption and compliance requirements. You should also list out all existing applications

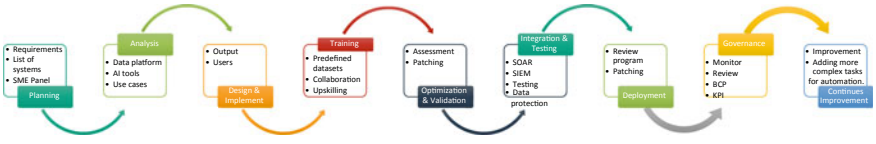

Fig. 7 Roadmap for AI implementation

and systems in the organization so that we do not miss out any critical application during rollout.

Analysis—In this phase, you need to analyze the data sets, data platform, AI tools and algorithms available in the market to identify the best ones that meet your organizations requirements. AI systems are heavily depended on the data that is fed to the system and is popularly publicized to be Garbage in garbage out systems. Identify the datasets that will be used by the AI based CTI system and evaluate them. The data sets used should be of the highest quality, up-to-date and complete. Specify which tasks should be automated by the AI based CTI system and which processes require human intervention. By the end of this phase, you should have selected the use cases that is easy to implement, provides significant benefits, has a high impact in the organizations cyber defense strategy. Select use cases that already have a high quality, complete, up-to-date data set that is readily available. The use cases have to be custom tailored based on the industry type of the SME. Some of the popular use cases are:

- Use of ML for analyzing huge amounts of data and identifying threats before it is exploited. ML can observe anomalies much quicker and with lot more accuracy than humans can and thereby enabling us to predict future threats.
- AI and ML can be used to track and detect any phishing attempts and remediate much faster than humans can. AI-ML can scan through every email in its network to detect phishing campaigns, block them or tag them immediately.
- AI-CTI systems can effectively combine threat intelligence received from various external sources such as discussion boards in the dark web, hacking patterns used, zero-day vulnerabilities, latest attacking trends, etc. This information can be used by the system to proactively determine when and how a cyber-attack might make its way to the organization. This will give the cyber advisors enough lead time to close the vulnerability or mitigate the risk.
- AI can be used to automatically learn the network topology, the traffic pattern and suggest security improvements. AI algorithms can be used to scour through large volumes of data, analyze them and identify anomalies. The AI algorithm can be trained to take some predefined steps in the event of an attack through inputs from the subject matter experts and overtime it will learn these response pattern and make its own decisions.
- ML can be used to learn and create a behavior pattern for your devices. AI can use this pattern to detect any anomalies on the behavior from these devices such as unusual amounts of downloads, uploads, financial transactions, shipments, data access, sudden change in typing speed, etc. Such activities will then trigger the AI algorithm to immediately flag those devices and block them. Al based antivirus software's can detect unusual behavior from programs rather than depending on traditional methods such as matching signatures of known malwares.

Design & Implementation—Design the AI solution using the selected data sets, platform, AI algorithms and tools. Specify what is the expected output from the system and who will be using the system. The solution is then implemented in a development environment.

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AI Training—Start building the AI intelligence using reviewed and approved data sets that were pre-defined as per our algorithm requirements. Exchanging and collaborating with other threat researchers and security professionals through various open-source threat intelligence platforms like Open threat exchange, Facebook threat exchange or IBM X-Force exchange is very critical for improving the efficiency and effectiveness of the AI algorithm in detecting new threats. Such collaborations help the AI solution to keep up to speed with the latest attack trends and vulnerabilities. Train cyber analyst for AI by upskilling their employees and improving their knowledge in the logic underpinning the AI algorithms and its behavior. Create proper interfaces that can enable them to interact with the AI tools and incident alerts. Provide the cyber analyst with a database for them to input information based on the customer feedback after an incident is raised.

Optimize & Validate—Optimize the AI based CTI system through fine tuning, patching and hardening to maximize the effectiveness and efficiency of the system. Deploy Security orchestration, automation and response (SOAR) technologies to improve incident alert triage quality, defining a standardized incident response workflow as well as improving the security and operations management. Create automated templates in SOAR for low-risk incidents with the actions to be taken such blacklisting IP, blocking IP, etc. Access and validate the performance of the system with respect to the initial requirements that were specified, ensuring they are functioning as intended.

Integration & Testing—Start integrating the system with the various applications that are part of the scope of this project. Applications such as SIEM can be used to integrate various security systems in the organization working in silos and then SIEM can be integrated to our AI based CTI to automate the tasks. The main hardware should not be connected to the internet. Test the system thoroughly to ensure the security and privacy requirements are met and data is appropriately protected with encryption. Use penetration testing and vulnerability assessment to detect the threats.

Deployment—The AI based CTI solution is deployed in the production environment. Continuously monitor the performance of the system, patching and hardening the system as and when required.

Governance—A clear, transparent governance process needs to be implemented and adhered to monitor the performance of the AI-CTI solution. The controls should include checks on the roles and responsibilities, segregation of duties (Mehmood et al. 2019), AI algorithm behavior abnormalities, risk tolerance, output verification and key performance indicators to measure the success of the program. It should allow the cyber analysts to assess and refine their Incident Response processes, Mean Time to Detect and Mean Time to Respond (MTTD and MTTR) matrix. The data sets and the initial requirements specified in the planning phase must be periodically re-evaluated to ensure the quality and effectiveness of implemented AI based CTI system. We should also look at documenting a business continuity plan (BCP) in case the algorithm goes rogue.

Continues Improvement—Once the organization and the cyber advisors are confident with the performance and the logic controlling the AI based CTI system, we should start looking at expanding the scope of tasks to be automated and include

more complex tasks to maximize the productivity of the program. Moreover, SMEs should continuously monitor and review each process so that the products efficiently and effectiveness improves over time.

Future research on various AI based cyberattacks by nefarious actors, their prevention and mitigation methods can further bridge the knowledge gap and secure the defense against such cyberattacks. The application of AI is a relatively new trend in combating cybercrimes and is still evolving. Further research should be conducted to improve the maturity of AI based cyber threat intelligence, their design, architecture and implementation. International Government bodies should also research and study how best they can legally cooperate and fight cybercrimes. The roadmap was evaluated and developed specifically for an SME; therefore larger organizations might have added requirements to be addressed in the roadmap.

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NoSQL: Future of BigData Analytics Characteristics and Comparison with RDBMS

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Abstract The growth of digital world has become so fast and the data volume turned to more composite in relations to size from terabyte and higher, the variation of data including structured, unstructured and hybrid, pace has gone so high in growth of data. This is called 'Big Data' as a worldwide phenomenon. Typically, this is measured as the collection of data from multiple sources has become so huge that it can't be well exploited or maintained by using regular methods used for data management: e.g., RDBMS the conventional relational database management systems or search engines used conventionally. The experts have been working to solve handle these problems, the traditional relational database management systems are modified by precisely

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_106

designed a set of substitutes DBMS's; which are search based systems, New SQL and NoSQL. This goal of this study is to provide characteristics, classification and evaluation of database management system called NoSQL in Big Data Analytics. The study is planned to help people, specifically the companies to gain. The current computation power also falls less against the massive extended storage volume. The fast growth of unstructured data requires a complete model change for the new age to meet the incoming challenges and observe the progress of new proficient techniques for data engineering. The explanation of BigData, RDBMS and NoSQL have also been described in this study to put light on difference of data and requirement of new technology. This study will highlight the differences, capabilities of both RDBMS and NoSQL database management systems in accordance with BigData. With the help of qualitative and quantitative approach the study has emphasized on the limitation of RDBMS and requirement of new technology NoSQL used for unstructured BigData used for analytics.

1 Introduction

NoSQL, for "Not Only SQL", attributes to a diverse and progressively more recognizable collection of non-relational data management systems; where SQL is not being used for manipulation of data as well as databases are not built primarily on tables (Akhtar et al., 2021; Al Ali, 2021; Alhamad et al., 2021, 2022; Ali et al., 2021). While working with massive data whose architecture does not necessitate a relational model NoSQL database management system are preferable. These structures are disseminated, non-relational databases planned for all-encompassing wide range data storage as well as for densely-parallel data operations and processing over a great amount of commodity servers. Non- SQL languages and systems are also employed by them to interrelate with data and information (although several latest APIs that renovate SQL inquiries to the system's indigenous query language or tool). NoSQL database systems came up next to chief Internet corporations, like Facebook, Amazon and google which experienced difficulties while working with massive amounts of data and information with usual RDBMS systems were not able to deal with. Multiple processes can be carried out by them like, investigative and prophetic analytics, ETL-style the transformation of data, and OLTP non-mission-critical (like handling transactions between organizations and long duration transactions). Unlike the conventional DBMSs and data warehouses, these systems as inspired by Web 2.0 applications are planned to reach out to the maximum number of those users who are doing updates and the reads as well (Ali et al., 2022; Alnazer et al., 2017; Alnuaimi et al., 2021; Alsharari, 2021; Alshurideh et al., 2022).

A relational database system which is planned and intended to offer ACID (Atomicity, Consistency, Isolation, Durability) properties, traditional SQL-based OLAP in Big Data domain and real-time OLTP (Online Transaction) are known as NewSQL system. Utilizing NoSQL-approach features like column-based information storage and scattered styles this system has covered up all the limitations encountered by

conformist RDBMS system. Other novel features introduced by this system are in-memory processing, symmetric multiprocessing (SMP) or Massively Parallel Processing.

The data that is too much comprehensive, ambiguous, readily changing is hard to be tackled using the conventional methods as per the observation of analytics. These days every research institution, businesses, and governments are generating extraordinary amounts of data which is too complex as well. Hunting of required information from such enormous data is very crucial for the organizations. It's a great challenge to extract the meaningful insight out of the bulk of data swiftly. That is why analytics has become inextricably important to understand the significance of Big Data to perk up their business performance and boost their market share. In the past few years, the ways to deal with the variety, velocity, and volume of big data has improved to a great extent. The immense rise in data size necessitates rapid analytics with each new inquiry by the application user. This situation has escorted the technologists to introduce a new DBMS system that can triumph over this processing holdup at Database side. As the structural design of RDBMS has restrictions to handle such huge data and carry out analytics. NoSQL architecture is specifically designed to deal with such speed breakers. Thanks to the flexible and adaptable architecture of NoSQL massive volumes of information can be processed rapidly.

In this paper, we will discuss the conventional RDBMS features as well as its limits to manage the huge data. Furthermore, NoSQL Databases will be discussed along with their types and distinctive characteristics to deal with Big Data will be explained. The application areas where NoSQL databases can incorporate will also be discussed. By means of the industry's experience with NoSQL, we will also attempt to elucidate the problems that can be encountered using later mentioned systems for Big Data. Finally, there is going to be a comparison between the two systems about how they contend with normal data to Big Data.

2 Literature Review

From the several data-models, the model that has been surpassing all others is a relational model from the start of early 80 s, with achievements like Oracle databases, MySQL and Microsoft SQL Serveralso known as Relational Database Management System (RDBMS). The models mentioned before are all designed on the relational model. The main reason to build RDBMS was to provide data processing to businesses and from that time till now RDBMS is proving as the best tool for information storage whether the information is personal data, financial statements, transaction processing and so on (Aziz & Aftab, 2021; Cruz, 2021; Eli, 2021; Farouk, 2021; Ghazal et al., 2021a, 2021b, 2021c, 2021d).

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2.1 Big Data

As time went by, the provisions for data kept on growing. This data has seen a revolution from structured to unstructured in form and from Megabytes, Gigabytes, Terabytes to Petabytes in size this ever-changing data has caused people to consider about a different solution to supervise this big amount of data. As the data became big, comprehensive, multifaceted, structured or amorphous, and diverse, it needed noteworthy consideration and concentration. Vast amounts of data are being produced at a very swift rate from a variety of distinct prospective areas, systematic tools, and the internet, especially the world known social media, mentioning a few of them. This type of data was termed as Big data. Big data points to those datasets the size of which are past the ability of typical database software techniques to capture, process and manage, store, and examine (Al-Khayyal et al., 2021; Al Batayneh et al., 2021; Alshurideh, 2022; Alshurideh et al., 2022). This characterization is deliberately subjective because it is evident that as technology progresses over the passage of time, the volume of datasets that become licensed as big data will also enlarge (Al Guergov & Radwan, 2021; Hamadneh et al., 2021; Hanaysha et al., 2021a, 2021b; Joghee et al., 2020; Naqvi et al., 2021; Shebli et al., 2021).

4v's can explain the nature of Big data easily. 4v's include Volume, Variety, Velocity, Variability.

2.1.1 Volume

The magnitude of produced and stored data, its importance, value and potential insight is determined by its size. Means whether the data is worthy enough to be termed as Big data or not.

2.1.2 Variety

Variety is the kind, category, and the architecture of the data. This assists experts who scrutinize it to efficiently employ the consequential insight. Big data it the collection of unstructured type data including videos, audios, images and text; also, it uses data fusion to fill in the missing pieces.

2.1.3 Velocity

It can be described as, the pace of data production and processing in the system to comply with the business requirements, tests, and obstacles that stretch out in the technique of escalation, improvement, and lastly the growth. Big data is usually obtainable in up to date format.

2.1.4 Variability

Irregularity and unpredictability of the data set can obstruct the course of action to hold and handle it (Fig. 1).

While considering big data, one problem is its growth, but the other bigger issue is the dire need to manage and store not just the structured data but also the unstructured data as well as the pictures, videos and files. An analytical case in point is that the relational model cannot deal with the data traffic that the social media sites like Facebook and Twitter produce, also it is not the type of data they want to store. Now, for the conventional data processing systems, this significant velocity of the increase in the volume of the data poses a solemn challenge (Alshurideh et al., 2020; Alzoubi, 2021a, 2021b; Alzoubi et al., 2022a; Alzoubi et al., 2020b).

Newly, though, in many cases, the utilization of relational databases escorted to troubles both due to discrepancy and glitches in the design of data and restraints of parallel scalability among various servers and massive size of data. The two main tendencies that brought the mentioned issues into the consideration of international software community are.

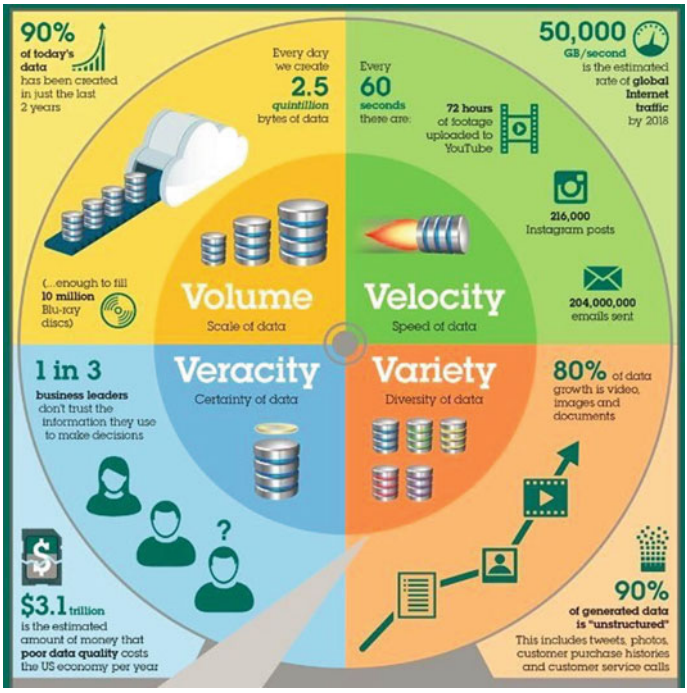

Fig. 1 BigData 4 V explanation ("Big Data," IBM, [Online]. Available: http://www.ibmbigdatahub.com/infographic/extracting-business-value-4-vs-big-data)

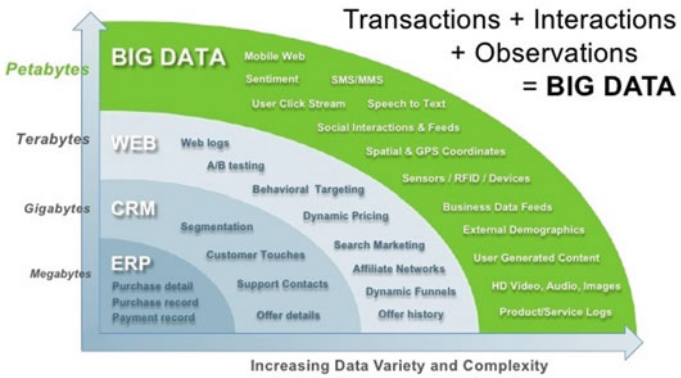

Fig. 2 BigData Transactions with Interaction and Observations (Slide Share, [Online]. Available:https://www.slideshare.net/cloudstack/vbacd-july-2012-apache-hadoopnow-and-beyond. [Accessed 12 February 2018].)

1. The massive increase of the quantity of data produced by sensors, systems and users, additionally fast paced by the attention of a huge module of this volume on big disseminated systems like Google, Amazon and other cloud services.
2. The escalating interconnection and intricacy of data fast paced by Web 2.0, Internet, social networks and exposed and uniform access to sources of data consists of different systems at a very large number (Fig. 2).

Big Data = Transaction + Observation + Interactions.

Due to this very reason, a lot of emerging companies took up different kinds of non-relational databases, which are also known as NoSQL databases and the application run arise e.g. Yahoo which used PNUTTS to fulfill enormously parallel and physically worldwide dispersed database system to run their web based applications.

Since their release NoSQL ("Not Only SQL") systems are extensively accepted in several realms. The main idea behind NoSQL systems is to hold up applications not properly served by relational systems, specifically those which involved in managing and processing BigData. NoSQL system can be classified as graph databases, document stores and key-value stores. It is important to mention here that, there is not one specific query language like standard query language used in RDBMS or a typical APIs used to communicate with various NoSQL systems. Normally, customers are required to use custom build APIs at programming level to communicate (Alzoubi & Ahmed, 2019; Alzoubi & Aziz, 2021; Alzoubi & Yanamandra, 2020; Alzoubi et al., 2020, 2021). This makes portability to be reduced and necessitates code at system-specific level.

2.2 Characteristics of RDBMS

The data organized in relational databases is in the form of tables, which are made up of columns and rows. In order to remove ambiguities during queries, these tables cannot have duplicate rows and every table has been assigned a primary key to a column that distinctively recognize each and every row that is known as record. For example, Fig. 3 demonstrates that Product_ID in the product table is the primary key. Author_ID Column used as Foreign Key in the Product_Book table, which is a child table, Author_ID column is used to reference Author table which is a parent table. The keys used like Foreign and performance, that scan be described as supplementary table relationships may possibly be mandatory while retrieval of data.

Multiple tale inheritances are utilized by libraries' database to hoard familiar traits in a common table knows as Product table (please refer to Fig. 3), every single one of unique attributes is kept in specific type product tables. This said method is far additional well-organized in contrast to concrete table inheritance where for every product category a new table is fashioned, and the queries used are custom-made for specific products. But, as explained to get all the significant characteristics of an established solution multiple table inheritance necessitate many joined operations.

The RDBMS make it certain to have Database ACID properties as the primary prerequisite. For databases, ACID properties act as the vital concept. The abbreviation globally knows as Atomicity, Consistency, Isolation, and Durability.

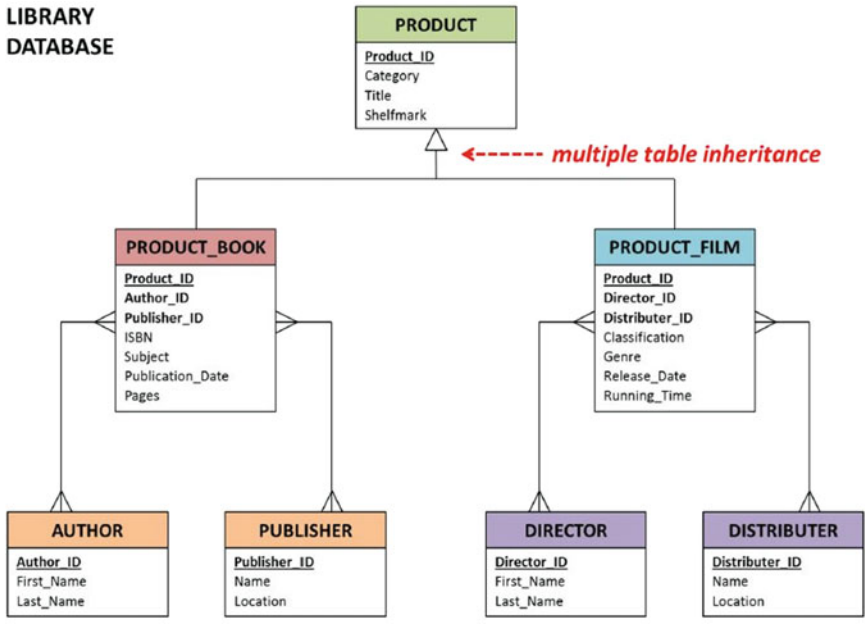

Fig. 3 Relational Database Schema [17]

The ACID makes certain arrangements to business to keep these purchase of sweater dealings from overlaying one another thus the merchant is kept safe from the flawed register and account balances.

2.2.1 Atomicity

Atomicity is the first ACID property and it is best explained by the phrase "all or nothing" to understand this let's consider an example; When a database gets an update, either all of it is available or none of the updates happen to be accessible to anybody past the application or user executing the update. The above-mentioned action performed on database is called a transaction and it is either assigned or canceled. In other words, only a part of an update cannot be put into the database, you get whole of it or none.

2.2.2 Consistency

ACID property of consistency makes sure that if there is a change to values in an instance then there will be a consistent change to other all values in that specific instance. The constraint of consistency is a base on data and it assists in the system as precondition, the condition after the execution knows as post-condition and at the end the change or transformation condition to be ensured on every transaction (Kashif et al., 2021; Khan, 2021; Lee & Ahmed, 2021; Lee et al., 2022a, 2022b).

2.2.3 Isolation

The third property knows as isolation section of the ACID is needed when there are many transactions running in parallel known as concurrent. The executions of transaction that take place in parallel are known as concurrent transactions, for example shared multiple users accessing shared objects in the figure the scenario is explained at the top as actions happening over time. Basically, the safety precautions employed by DBMS to thwart clashes between concurrent transactions is known as isolation.

Let's understand this with the help of an example, if there are two parties updating the similar catalog article, the changes made by the first party should not depend on or be affected by the changes made by the other party to be able to work in isolation means that both parties act as they are the solitary user. Every change must be kept isolated from other users of the same catalog (Fig. 4).

Serializability is another important concept which should be understood while debating separation over transactions. The execution of transactions could be serialized once the consequence on the database is unchanged whether the transactions are executed in an interleaved manner or in serial order. Concurrent transaction i.e. Transactions 1 through Transaction 3 are being executed at the same time as it can be seen in the figure. An important point to keep in mind here is that in serialized

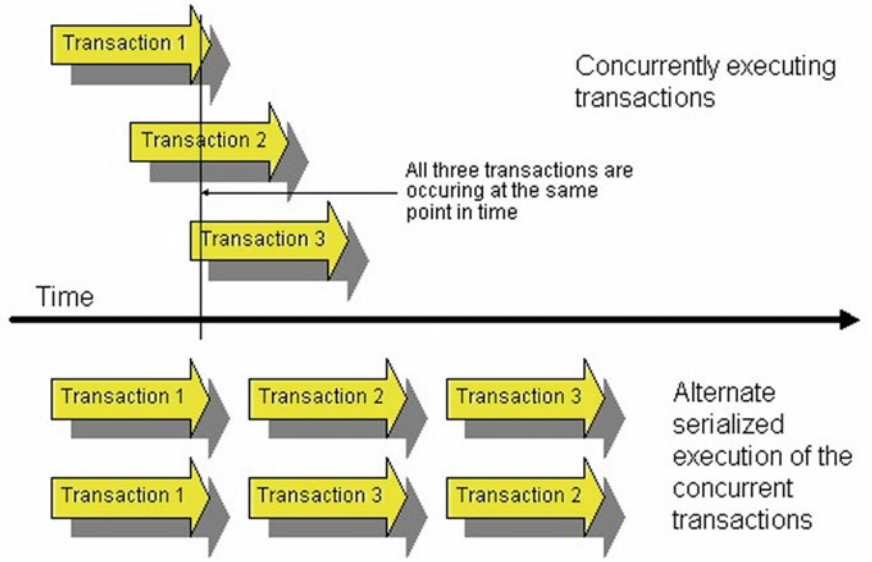

Fig. 4 Isolation Relational Database Property ("Database ACID Properties," [Online]. Available: https://www.servicearchitecture.com/articles/database/acid_properties.html.)

execution it is not compulsory that transactions started first will be the ones automatically completed before the finishing the other transactions in the sequential execution (Mehmood, 2021; Mehmood et al., 2019; Miller, 2021; Mondol, 2021; Obaid, 2021).

2.2.4 Durability

Durability is that ACID property which attends to the need of keeping a record of committed transactions. These updates are not supposed to be missed in any case as it's a very critical thing. It's the systems capability to recover the completed transactions in system or storage media failure. The durability features are as follows:

- The recovery of recently committed transactions in case of database failure
- The recovery of recently committed transactions in case of application failure
- The recovery of recently committed transactions in case of CPU failure
- The recovery of recently committed transactions in case of storage.

The restrictions of RDBMS's are to deal with amorphous, diverse, heterogeneous, massive amounts of data. For RDBMS retailer it is a huge challenge because of its architecture. This test to manage the big data has compelled them to devise a new technology that can handle the said amounts of data and information.

SQL-Like centralized databases have been pushed towards their perimeters by computational processing and storage requirements of applications like Big Data used for Analytics, Social Networking and Business Intelligence having large than

petabyte datasets. So, these limitations of paved a way that directed to the growth of horizontally ascendable, dispersed non-relational type of data stores, which are called as No-SQL databases, like Google's has built open source HBase implementation and Bigtable and the well-known Facebook has Cassandra. The effectiveness, competence, and cost-effectiveness of these approaches are gained by the embodiment of distributed architecture-based key-value stores, for example Voldemort and Cassandra. In regard to Data warehousing, Web 2.0, Grid and applications used in Cloud were very hard with RDBMS and it was a major drawback of this system. Pokorny (2013), emphases mainly to NoSQL databases from the perspective of cloud environment, chiefly concurrency model and scalability in horizontal fashion. The Relational Database Management Systems (RDBMS) and NoSQL databases are differing from each other, but NoSQL databases did not assure ACID properties (Radwan & Farouk, 2021; Shamout et al., 2022).

2.3 Characteristics of NoSQL Databases

The conventional database systems are designed on the basic idea of execution of transactions in the manner to keep the data veracity and reliability. This keeps the data consistent while managing it. The features of transactions are also known as ACID (Atomicity, Consistency, Isolation, and Durability) as we have already discussed. Though, developing a system compliant with ACID has made known to be a trouble. CAP-theorem has been observed, i.e. clashes arose among distributed systems diverse sides of high availability that are not completely resolvable.

2.3.1 Strong Consistency

On updates to the data set the version of data seen by the clients is totally same e. g. through the method of two-phase commit protocol (XA transactions), and ACID.

2.3.2 High Availability

In the case, if a few of the machines in a cluster are not working, all the clients still can always find a copy of the requested data. Down machines do not create a problem in this matter.

2.3.3 Partition-Tolerance

The goal of the entire system always is to maintains its characteristics and features even while being positioned on various servers at the same time being transparent to

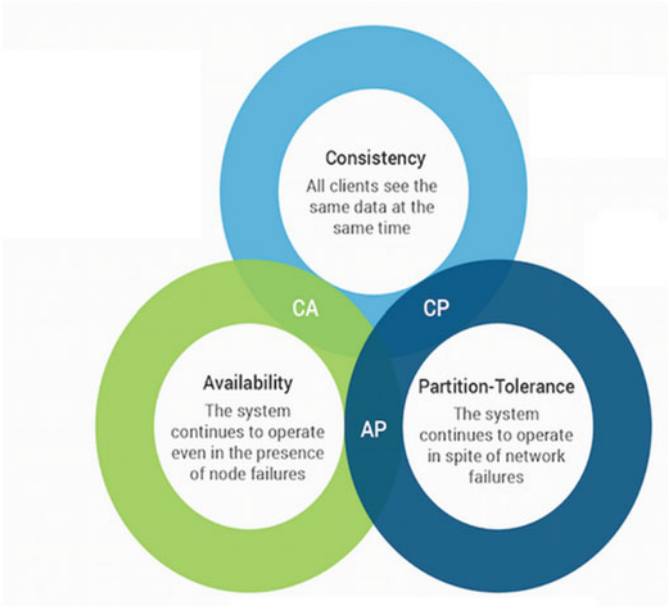

Fig. 5 Characteristics of NoSQL Database

the client. According to the CAP-Theorem, at the same time, out of three only two dissimilar aspects of scaling out can be attained entirely (see Fig. 5).

To attain improved Availability and Partitioning a lot of the NoSQL databases mentioned above have lessened the needs for Consistency. This step laid the way to develop systems globally called as a BASE (Basically Available, Soft-state, Eventually consistent). NoSQL databases have been classified according to the CAP theorem by Han, J. They had compared different NoSQL databases by executing multiple different criteria (Al Ali et al., 2021; Alzoubi et al., 2021; Batayneh et al., 2021).

Main Usages of NoSQL Database can be categorized as (1) Huge-scale and wide data calculation and processing (processing in parallel in the distributed systems); (2) Embedded IR (general machine-to-machine data search and reclamation); (3) Investigative analytics done on unstructured and structured data (knows as expert level); (4) Huge size data storage (unstructured, semi-structured, small-packet structured) (Afifi et al., 2020).

They prove valuable as well for machine-to-machine communication for information and data retrieval, recovery and exchange, for dispensing large number of executions, to the extinct ACID restrictions can be made soft, or the way is to apply them on application side not on DBMS side. In conclusion, when we are to deal with semi-structured or hybrid data these systems act as very good probing analytics, nonetheless to get to the lowermost of intellect, the researcher should be a skillful mathematician working in accordance with an expert programmer (Ghazal, 2021; Ghazal et al., 2021a, 2021b).

Table 1 Key-Value store NoSQL Database

CAR	
Key	Value
1	Make: Infiniti Model: Q50 Color: White Year: 2016
2	Make: Volvo Model: XC90 Color: Beige Year: 2009 Transmission: Auto Type: 4*4

"Characteristics of NoSQL," [Online]. Available: https://www.forbes.com/sites/forbestechcouncil/2017/09/18/renaissance-in-cloud-datamanagement/#4509108030cf

2.4 Classification of NoSQL Databases

NoSQL databases have been classified by Leavitt (2010) in three types: Key-value stores e.g.SimpleDB column-oriented databases—e.g. Cassandra, HBase, Big Table and document-based stores—e.g. CouchDB, MongoDB. In this segment, according to the suitability of different kinds of tasks we categorize NoSQL Databases into four basic categories,

(1) Key-Value stores.
(2) Document databases (or stores).
(3) Wide-Column stores.
(4) Graph databases.

2.4.1 Key-Value Stores

Classically, in these DBMS the data objects are stored as alpha-numeric identifiers (keys) and related values in plain, standalone tables (also known as —hash tables‖). The values could possibly be as simple as text strings or could be more complex like lists and sets. Data searches can usually one can perform data searches only with the use of keys, not values, and they are restricted to precise matches. See Table 1.

2.4.2 Document Databases

As the name indicates, document databases and the idea were derived from Lotus Notes, these mainly are designed and intended to store and manage the different kind of documents. Customary data exchange systems like JSON (Javascript Option Notation), XML, or BSON (documents are encoded by Binary JSON). Contrasting to

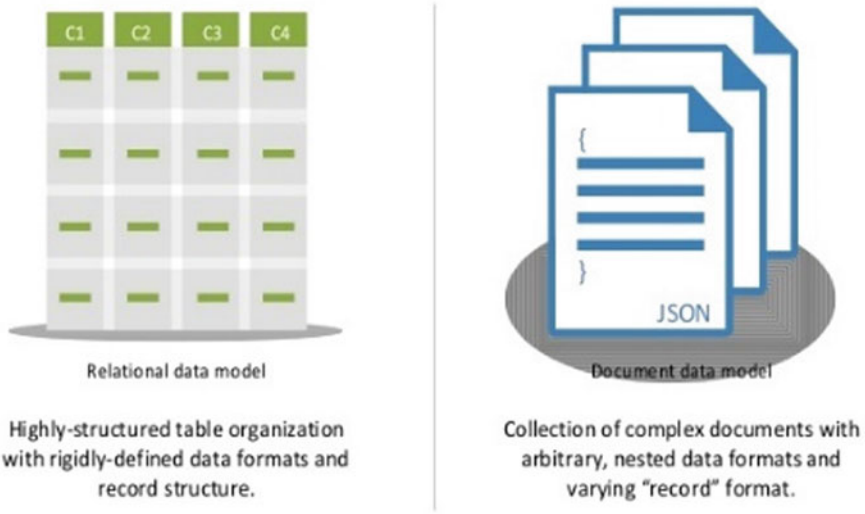

Fig. 6 Document Type Database vs Relational Database (Slide Share, [Online]. Available: https://www.slideshare.net/cloudstack/vbacd-july-2012-apache-hadoopnow-and-beyond. [Accessed 12 February 2018].)

the uncomplicated key-value stores illustrated above, in the value column of document databases structured and unstructured data is present—particularly attribute name/value pairs. Hundreds of these attributes can dwell into a single column, also from row to row the type and number of attributes recorded can differ. In document databases, the values and keys are totally searchable which is in contrast with simple key-value stores (Ghazal et al., 2013, 2021c; Kalra et al., 2020) (Fig. 6).

2.4.3 Wide-Column (or Column-Family) Stores (BigTable-Implementations)

Wide-Column (or Column-Family) stores (after this WC/CF) are just like document databases. To house multiple attributes for each key they utilize a column based distributed data structure. Whilst several WC/CF stores comprise a Key-Value DNA (for example the Cassandra Dynamo-inspired), the majority are designed like Google's Bigtable, that is petabyte scale internal system based on distributed storage for data. This system is developed by Google for its famous search engine and additional products like Finance by Google and Google Earth. In general, the capability is not only to reproduce Google's storage structure BigTable, but Google's file system which is distributed in architecture (GFS) and its processing framework which is parallel MapReduce too. Similar scenario is with Hadoop, which comprises the file system called the Hadoop File System (HDFS, based on GFS) + Hbase (a

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Fig. 7 NoSQL Wide Column Database ("Graph Databases: NOSQL and Neo4j," infoQ, [Online]. Available: http://www.infoq.com/articles/graphnosql-neo4j [Accessed 26 March 2018].)

Bigtable-style storage system) + MapReduce (Khan et al., 2021; Lee et al., 2021) (Fig. 7).

2.4.4 Graph Databases

Relational databases have been replaced by graph databases with more organized relational graphs having key value pairing interconnected to each other. These are like object-oriented databases because of the graph is illustrated as object-oriented network of graph nodes, (objects in concept), relationship of node knows as edges and properties (the object characteristics stated as key-value pairs). The four NoSQL forms conferred here are those that are related with relations. Among other NoSQL DMS, these types are considered more human-friendly because they focus on the visual depiction of data and information (Fig. 8).

Many big organizations that deal with big data have now adopted NoSQL. Following is the table that shows a few of these big businesses (Table 2).

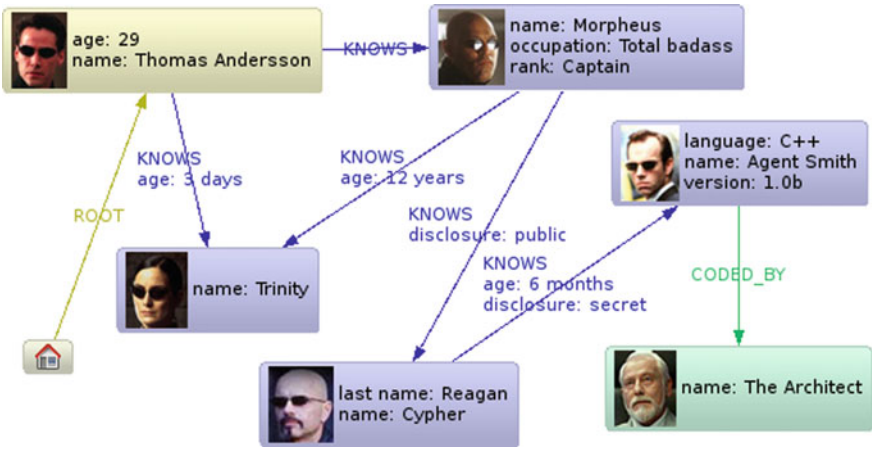

Fig. 8 NoSQL Graph Database Store ("Graph Databases: NOSQL and Neo4j," infoQ, [Online]. Available: http://www.infoq.com/articles/graphnosql-neo4j. [Accessed 26 March 2018].)

Table 2 NoSQL type used by Companies

Company name	NoSQL name	NoSQL storage type
eBay	Cassandra MongoDB	Column Document
Facebook	Cassandra	Column
Lots of Words	CouchDB	Document
MongoHQ	MongoDB	Document
Mozilla	Hbase	Column
Netflix	Hbase Cassandra	Column Column
Twitter	Cassandra	Column

Big businesses because of their high data storage demands have converted to NoSQL and its experts are also in the favorable light now.

2.5 Comparison Between RDBMS and NoSQL

In this study as the characteristics of both RDBMS and NoSQL has been described, the comparison between RDBMS and NoSQL has been analyzed in detail. Which shows the major differences and capabilities of both systems according to customer needs (Table 3).

Table 3 Comparison between RDBMS and NoSQL (Author Created)

S. No	Description	RDBMS	NoSQL
1	Data size	Gigabyte, Terabyte	Petabytes and greater
2	Schema	Static Schema	Dynamic Schema
3	Type	Relational	Non-Relational
4	Data	Structured	Unstructured
5	Scalability	Vertical	Horizontal
6	Language	Standard Query Language	Un-structured Query language
7	Joins	Helpful to design complex queries	No Joins, don't have interface to design complex queries
7	OLTP	Recommended and best used for OLTP Systems	Less likely to be considered as OLTP systems
8	Flexible	Rigid Schema, relationship bounded	Very flexible and no rigid Schemas
9	Auto elasticity	Require down time in most cases	Automatic, no outage required
10	Consistency	Strong consistency supported	Consistency varies per solution; some solutions have tunable consistency
11	Scale	Scale well vertically	Scale well horizontally
12	Transaction	ACID	CAP Theorem

"Characteristics of NoSQL," [Online]. Available: https://www.forbes.com/sites/forbestechcouncil/2017/09/18/renaissance-in-cloud-datamanagement/#4509108030cf

3 Material and Methods

In 1980's the primary cohort of commercial systems come into sight by Teradata Corporation and in the same time, the necessity surfaced for well-defined systems to determine the ability of DBMS dealing with very big quantities of data. Motivated by vendor's desires to weigh the commercial systems, in the starting of 90's the Transaction Processing Performance Council designed a series of data warehouse end-to-end benchmarks. Likely systems have been developed by TPC-H and PC-R at the beginning of 2000 (the details are all accessible from the TPC website2). With some update on a venture data warehouse, these benchmarks are limited to a data size of a terabyte, highlighting single and multi-user performance of complex SQL query processing abilities. Even before this, academia had started developing micro-benchmarks like EXRT and XMark benchmarks for XML-related DBMS technologies and the OO7, the Wisconsin benchmark, and BUCKY benchmarks for object-oriented DBMSs, (Matloob et al., 2021; Naqvi et al., 2021).

With the passage of time, the volume of data kept on growing from megabytes to petabytes in size and from simple data models (a few tables with a small number of relationships) to complex ones (big tables with many complex relationships). This change in the demand for data needs has led TPC to act in response. In the dawn

of 2000's TPC-DS developed its next generation decision support benchmark. Its foundation is based on the SQL programming language, but it consists of several big data elements, like exceedingly large system sizes and data. Even bthough the existing limit is 100 terabytes; the schema and data generator can be expanded to petabytes. Quite composite analytical data queries are also contained by it using sophisticated and complicated SQL structures and a synchronized update model.

3.1 Adaptation of NoSQL

The term NoSQL was invented in 1998. Lots of people assume NoSQL is a deprecating term fashioned to jab at SQL but in actual, the term NoSQL stands for Not Only SQL. Putting forth the idea that both these technologies SQL and NoSQL can exist together in their own specific place. For the previous few years, NoSQL technology has been heard and seen in the news most likely because of the reason that as many of the Web 2.0 leaders have taken the NoSQL technology. Facebook, Twitter, Digg, Amazon, LinkedIn and Google all these companies use NoSQL in one way or another.

The main factors behind the adaptation of NoSQL includes flexibility of data, no rigid schema and scalability.

3.2 Questionnaire Development

As discussed earlier technology is changing extensively, and data is becoming more crucial to any organization. The accessing and manipulation of data is much more necessary than saving it to storage. Accessing and storing of data to storage obviously is time consuming. The RDBMS's due to their architecture must consider the data types, relations and other hidden processes involved in execution and storing the data to disk and the same when accessing the data from storage. This adds up the time which is very crucial for the applications to respond. The massive data growth requires additional storage on the fly. This is difficult to manage in RDBMS environment (Rehman et al., 2021; Suleman et al., 2021).

On the other hand, accessing and storing of heterogenous type of data in NoSQL environment is very fast. The flexibility of multitype data such as text, images, videos and documents are managed very efficiently. The schema free and no predefined architecture gives a strong advantage over RDBMS. Dealing with enormous growth of data is very easy in NoSQL environment as it gives flexible scalable architecture by adding more and more additional servers called shards in running environment.

Qualitative Study has been done on previous researches for the same topic. This has helped enormously to get the basic idea about the database vendors and organizations requirements and improvements which have been done to accomplish the

day-to-day challenges. This also has shed light on the technology enhancements in this specific field within last 2 decades.

3.3 Data Collection

A questionnaire survey has been conducted as part of quantitative method. To get the current situation in dealing with bigdata and analytics a questionnaire has been developed and spread in IT field. The targeted people were IT company CEO's, CTO,'s, Database Administrators which are dealing with day to day management challenges and the network professionals which are designing networks to deal with bigdata. The results are then analyzed by the respondents and have helped in getting the result and findings for this study. As the restriction of direct access to all the respondents the study focused on various methods to collect data which include professional groups, emails, printed copies to professionals in contact. The results are then analyzed and discussed in Chap. 4.

4 Results and Findings

As the world already has adopted the NoSQL Database, to analyze the levels and reasons of moving the software developing companies towards it a survey has been conducted. The survey has been conducted to analyze and judge the necessity of NoSQL with respect to business needs, Data management problems, flexibility or low-cost DBMS adaptation.

The survey has been conducted among database administrators, IT company CEO's, technology decision makers, software developers and IT experts. The survey has been conducted considering those people doing business in RDBMS and Big Data.

The main points of the survey are given below.

- About half of the more than 250 respondents pointed to the fact that they have worked on NoSQL projects in past couple of years. The companies which have secured large software projects more than 50% of their projects are to deal with Big Data for their clients. The reasons of adaption of NoSQL is described by them as:
- 49% referred to inflexible schemas to be the major reason for their migration to NoSQL technology from the relational database system. A prime reason for switching to NoSQL is the deficiency of scalability and high latency/low performance when dealing with Big Data.
- Overall, 40% were of the viewpoint that NoSQL is very essential and significant to their daily operations, and it is continuing to become more important.

- The management of Big Data in NoSQL is much easier than in RDBMS due to the pre-defined architecture and limitation. As the capturing of multi structural data is greeted in NoSQL. The type of data is high rank in considering the NoSQL database to be used (Figs. 9, 10).

As per the above survey results explains according to software professionals the major factors which take part in deciding about NoSQL and RDBMS are BigData, unstructured data and the management of the same. This means when the experts have to deal with massive amount of unstructured data, they are more likely to adopt NoSQL (Fig. 11).

- Another question regarding the performance of NoSQL using BigData shows the experts agreed on having better performance than RDBMS.

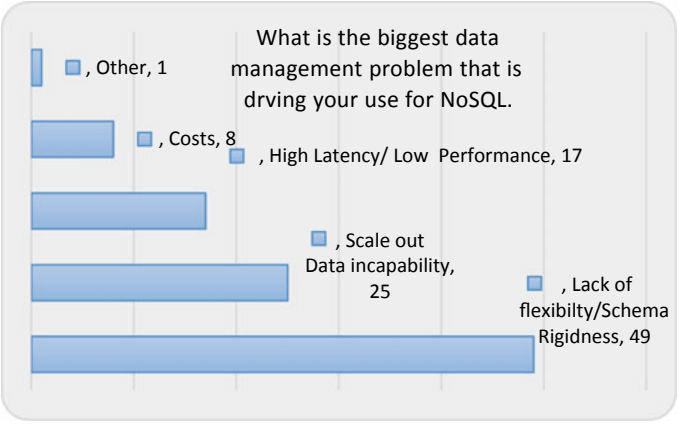

Fig. 9 Problems to driving towards NoSQL (Created by authors)

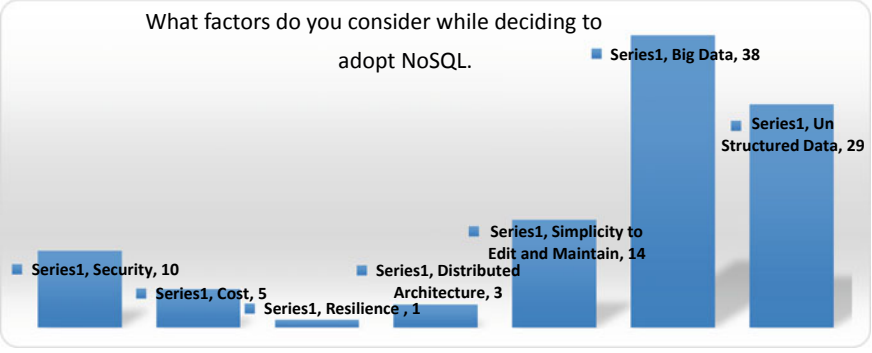

Fig. 10 Factor to decide NoSQL (Created by authors)

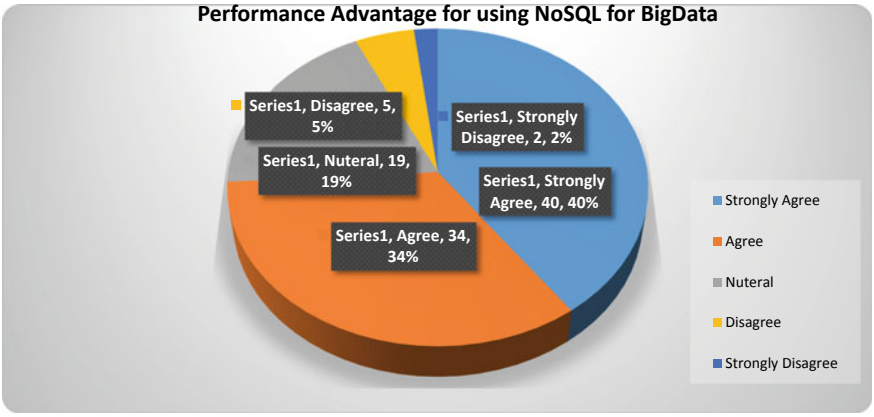

Fig. 11 NoSQL Performance with BigData (Author Created)

The architecture of DBMS and data has the main effect on performance. Performance is the major requirement of all bigdata based companies. At the same time fast data store and access is the major challenge for DBMS vendors and they keep doing research on this to get the customer's confidence. In the survey 40% of the respondents strongly agree that NoSQL perform well when dealing with BigData along with 34% agree for the same.

Those organizations that show considerably high needs of storing data are considering NoSQL seriously and the demand of NoSQL database experts have also risen to a higher level in these developing organizations.

Overall, the results of the survey can be concluded as more than 65% of the respondent are agree that when it comes to deal with BigData they have used, or their first choice is to go with NoSQL. The reasons that have emerged from the survey answers are particularly highlighted as pre-defined schema in RDBMS. This has very strong characteristic and work very well in small to large databases which deals with structured and well-organized data. This kind of architecture is very popular and successful in OLTP environments like Banks, online retail shops and university library systems. The ERP systems also have pre-defined database architecture and are doing well with RDBMS. However, when it comes to very large to huge databases with the data volume from petabyte and greater, unstructured type of data including text, files, images and videos and all incoming very massively, it cannot be handled by RDBMS with high performance. The massive increase in data also require scalability at hardware level and the DBMS system should accept it on the fly. This has been the major characteristic of NoSQL DBMS that it dynamic schema and accept any kind of data. As the previous studies has shown social media is growing very widely in terms of data and dealing with all kinds of data, all the social media systems are using NoSQL in one way or another. So, the other top factors highlighted as scalability, performance when dealing with BigData, simple in maintaining the system.

5 Conclusion

Storage and processing requirements of some applications like Analytics for Big Data, Business Intelligence and social networking which is growing rapidly over peta-byte datasets have forced RDBMS to their limits. This has directed to the development of technology that is horizontally scalable, dispersed non-relational database named as No-SQL. The study speculate about the primarily usages of NoSQL Databeses: The larger scale data processing system (parallel processing over distributed systems), (machine-to-machine data look-up & recovery); Analytics on semi-structured data (professional level); Huge capacity data storage (structured, semi-structured, unstructured) NoSQL is a huge and growing field, for the purposes of this study, characteristics (benefits and features of NoSQL DBMS); classification (the four categories with their features); and the comparison and assessment (with a table on basis of few characteristics- strategy, integrity, attributes, distribution) of different kinds of NoSQL databases. The study has also shown the difference between DBMS and NoSQL with present state and reason of acceptance of NoSQL databases. This study with motivation has provided an autonomous understating about the weakness and strengths of NoSQL databases which are supporting the applications that are dealing with large volume of data. The study has concluded the applications dealing with BigData performs well in NoSQL environment. Still the requirement varies from solution to solution. NoSQL will be emerging as the solution for BigData analytics in future.

5.1 Future Work

As the technology has been changing rapidly, the business is more relying on analytics. The analytics is based on data and the data is growing massively. The fast processing of this data is the major need of every organization. This is forcing technology leaders to put more efforts in making the DBMS more efficient in dealing with BigData. NoSQL has fulfilled the requirement to some level. However, there are still challenges that need more efforts from DBMS vendors to get confidence of customers. The main challenges are like data security and more compatible environments to most available development systems. Hope this study will help the users to understand the different DBMS architectures, BigData and its requirements and how to deal with this by understanding the nature. And will help users to guide to make decision while choosing DBMS according to their need and DBMS capabilities.

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Internet of Things Connected Wireless Sensor Networks for Smart Cities

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Abstract The Smart City is the most complete and covered framework that meets the need of different project facets related to the smart city. It allows the cities to use the urban network and raise their economic power, unique solutions of technology, and build the most efficient systems. Smart City is the advanced developmental product of the smart economy and information technology. It relies upon wireless networking, broadcast networking, internet mesh networking, telecommunication network, and the end-to-end sensor network in which the Internet of Things (IoT) is the core. The IoT serves as the core for integrating the wide variety of sensors in each day's objects and interconnects the sensors through the internet using specific protocols for exchanging the communications and information that lead to location tracking, management, monitoring, and intelligent achievement recognition. It not only supports one city but also interconnects it with the other smart cities. This paper

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_107

aims to explore the use of IoT-based machine learning approaches that help develop a smart city.

Keywords IoT · Machine learning approaches · Smart City · Wireless sensor network

1 Introduction

Internet of Things (IoT) has been one of the leading technologies of the rapidly blooming trends within the environment and smart cities (Alshurideh et al., 2022). According to the sources, the term IoT was first defined in 1999 as the basis of infrastructure for the information society. The IoT or Internet of Things is the system that includes buildings, modern vehicles, physical devices, and the most important electronic devices that we use daily and are interconnected with each other on the internet to enable the collection and exchange of data (Ali et al., 2020). The Internet of Things allows users to control their devices through remote access across the network's already built infrastructure. It then enables the user to an effective and direct computer-controlled system implementation within the physical world (Ghazal et al., 2020). This is how it allows the rise in the precision, reliability, speed, and efficiency of the system and reduces human beings' intervention. When the IoT is. connected with the actuators and the sensors, it is converted into the cyber-physical system that is the smart city establishment (Saha et al., 2017).

From the last decade, the Internet of Things technology has played the most significant role not only in smart cities but also in smart homes, smart factories, and various smart grids, etc. The IoT operations here rely upon different sensors, video cameras, and mobile devices within the cosmopolitan city to share the data through the internet (Minoli et al., 2017). The most important assisted element of this Internet of Things (IoT) technology is the Wireless Sensor Network (WSN) which is the core of the IoT approach. The WSN has numerous sensor nodes that allow data management within the smart city circle (Ali et al., 2021). Moreover, every node of the wireless sensor network is utilized for a particular purpose and is operated with the battery's help that consumes the energy to process the data in every framework communication of smart city (Aljumah et al., 2021; MAlshurideh & Shaltoni, 2014; Alyammahi et al., 2020; Hasan et al., 2020; Shakeel et al., 2019; Sweiss et al., 2021).

At the current moment, Smart cities and Smart homes have the infrastructure that requires extensive control and monitoring of the information collected. This process has been made simple through the wireless sensor network that organizes the data through sensor nodes formulation as the self-sufficient model (Alzoubi & Aziz, 2021). Within a few years, the smart city's monitoring is extensively utilizing WSN and its use has been extended to home automation, environmental monitoring, and healthcare monitoring (Zanella et al., 2014). According to the results of a recent survey, it has been showing that the IoT technology has earned quite a significance

due to its use in the construction of smart buildings that have inheritance property to make them more sustainable and allows conservation of energy (Zygiaris, 2013).

The smart city's management framework utilizes the IoT devices used for various purposes, including designing nonstandard cooling and heating that connects the lighting which is dissimilar, and the fire safety system for a central management application to build up the standards. The IoT can change the water consumption ways in urban areas by implementing smart meters that enhance information integrity and leak detection (Ali et al., 2022). Additionally, it allows the assistance in strengthening different companies production and helps them in monitoring the loss in revenue owing to the mismanagement of time to process the information (Vlacheas et al., 2013).

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Furthermore, such smart meters can also be used to throw light over the technology necessary for the user by establishing real-time access to the residents. It allows monitoring of the consumer-facing gateways to collect data about water supply management and its use (Ejaz et al., 2017).

The IoT is also helpful in checking the smart traffic signals by adjusting the traffic and shifts during the holidays and keeping the cars moving without any manual interference. It allows the city authorities to collect information regarding traffic from vehicles, traffic cameras, road sensors, and monitors the accidents of traffic without any hurdle (Alzoubi et al., 2021). This puts the drivers on caution against the coordination and incidents of driving. Such types of prospective are quite infinite and the expected outcomes are generous (Sanchez et al., 2014). By taking the help of the IoT system, public transport is easily monitored and stays unobstructed. It keeps an eye on the roadblocks either due to heavy weather or the equipment breakdown (Guergov & Radwan, 2021; Khan, 2021; Mondol, 2021). It offers real-time data for the transport experts to carry out the emergency plans. It guarantees constant access to the network, providing full security and quick public transport through assisted devices and smart cameras at the transport covers and the other areas (Perera et al., 2014).

The smart cities now carry many surveillance cameras that have smart access and they monitor the control of traffic for the safety concern incidents within public streets. The software for video monitoring utilizes the services of IoT. It connects every camera of the system within the sensor to sense and measure data based on cloud-assisted IoT through computing and edge analytics using the WSN channel. The IoT's machine learning approach allows the completion of the investigation study by sending the recording of video to belonging people who can explain the issue and keep the people under protection (Talari et al., 2017).

The basic structure of the cloud-assisted wireless sensor network includes the sensor node. These sensor nodes are made up of the sensor arrays, System-On-Chip (SoC), distribution units, wireless communication interface, and the power supply (Alnuaimi et al., 2021; Alshurideh et al., 2019; AlShurideh et al., 2019; Joghee et al., 2021). The wireless communication interface of this sensor allows each node to work separately.

2 Iot-Based Wsn for Reducing Energy Consumption

There are two approaches: Hierarchical strategic making (HCSM) and the Dynamic Stochastic Optimization Technique (DSOT) system assisted by IoT that helps optimize the energy within the Wireless Sensor Network to monitor smart city to manage the data. One study has been conducted by Meenakshi et al., has combined the two approaches within the smart city for helping in reducing maintenance cost, consumption of energy (Akhtaruzzaman et al., 2020), and the environmental impact to lead towards efficiency with adoption of distinct elements within a single framework. The proposed models utilizing the two technologies achieved a better performance ratio (95.3%), higher prediction ratio (96.54%), higher reliability ratio (92.4%) in comparison with the existing approaches. The study showed better environmental impact with low cost and low consumption of emergency by combining HCSM and DSOT. Moreover, the IoT based Wireless sensor network has helped enhance network lifetime and the node battery life (Sundhari & Jaikumar, 2020).

Many other studies have utilized machine learning approaches to reduce energy consumption. According to the study conducted by Karan Nair et al., the Bluetooth Low Energy (BLE) method was utilized to optimize the consumption of energy within wireless sensor networks of IoT (Nair et al., 2015). The study utilized the hybrid topology for reducing the cost as well as consumption of energy (Alshurideh et al., 2012). It has been mentioned that the BLE approach can be used in operating utilized network topology whereas the hybridized star and mesh topologies use the multi-hop mesh topology (Alzoubi et al., 2022; Obaid, 2021).

A study carried out by Xue Wang et al. (2009) started algorithms of parallel sensor deployment optimization and the parallel particle swarm optimization (PSDO—PPSO) to mark the optimized energy tracking within WSN. The later algorithm, Parallel particle swarm optimization is utilized within-cluster head to enhance the area of coverage and reduce the power of communication within each cluster. On the other side, the former algorithm, the Parallel sensor deployment optimization algorithm, has been utilized to reduce the tracking of a target and energy consumption (Ahmed et al., 2020). Both approaches have found significant improvement in the reduction of energy consumption.

RERUM (Reliable, Resilient, and Secure IoT for Smart City) utilize framework to secure the smart city and provide security using IoT (Pöhls et al., 2014). The RERUM algorithm efficiently sensed the environment in a timely and trustworthy manner and is found best in improving the smart city's architecture. The RERUM has been integrated with IoT to enhance IoT reliability by providing security and protection to a smart city's applications (Aburayya et al., 2020; Al Batayneh et al., 2021; Al Shebli et al., 2021; Alshurideh et al., 2021; Alzoubi et al., 2020). The RERUM framework offers the application scenario and attacker model to achieve protection within a smart city.

One other method, named Media Based Surveillance system (EAMSuS) has been suggested by Vasileios et al., for the inculcation of the quick algorithm within the IoT smart city system (Memos et al., 2018). This framework provides the daily security

system that assures the most secured and light transmission of the rapid media sharing within the smart city (AlHamad et al., 2021; Alzoubi, 2021a, b; Farouk, 2021). The study achieved the low consumption of memory at IoT integrating WSN assistance in cybercrime social cloud for management of the smart city.

3 Iot Based Water Supply System

Water is the most demanding thing in the industries in urban cities due to economic sprouting. Such demands are often not met because of the short water supply and the high-water wastage culture. The water is wasted due to many reasons including majorly human error and then pipeline leakages or errors due to operator's negligence (AlHamad et al., 2022; Alzoubi & Ahmed, 2019). Water supply is quite irregular and water wastage can be managed with PLC use that can efficiently control the water supply system. Monitoring industries' water resources can properly control water theft. The supply chain of water in the urban areas is directly related to the water supply and its consumption (Joghee et al., 2020).

The water quality control distribution system must be by the water quality control, its continuity, water theft prevention, and monitoring technological processes. It must also cater to restrictions imposed concerning water availability, water tanks' storage capacity, and the wide water use (Hanaysha et al., 2021a, b). The supply system is made up of storage tanks, filtering units, pump stations, and the distribution network through dispatching units or pipelines. One structural system SCADA carries more than one PC major station that is the communication center linked through IoT with the other PLCs that are integrated within the pumping station. PLC also controls the technological process and the data collection and reports a similar operational hub for the analysis (Verma et al., 2015).

3.1 Current Water Supply System

The existing supply system is full of water wastage and theft. It is irregular but inefficient and doesn't meet the restrictions applied to it considering water tanks' storage capacity, water availability, and wide water usage. The existing system is widely dependent upon manpower and the person chose performs the job manually. Such higher dependency upon manpower makes the system highly prone to human error and is inefficient. This system allows a higher chance of personal water theft by simply attaching a house pump with a supply system and it leads to the wastage of the resources (Alzoubi & Yanamandra, 2020) This is why the system is full of unethical and irregular water distribution.

3.2 Automated Water Supply System

In the automatic supply system, the equipment is installed at the pumping station and is controlled with the help of IoT related PLC (Programmable Logical Controller) equipment that uses electrical and hydraulic parameters. The pumping function module present in PLC carries an optimization tool that allows a schedule for water distribution. It prevents water theft, creates water demanding statistics, has proximity sensors for detecting water and plans, and maintains water wastage reduction.

If the water levels detected are low, the sensor in the equipment signals PLC to initiate the pump station motor. The sensors' current status is displayed on the PC and the user graphical interface is created with SCADA software. Module for optimization helps in the reduction of water resources wastage based on machine learning algorithms (Alzoubi et al., 2019). Such algorithms reduce electrical energy cost by managing the schedule for pumping and predicting the times of engine on and off. It also helps in maintenance planning because of loading. The PLC is the central part of the automated water supply system that manages motor and pumping units and data is displayed on SCADA software in real-time for the user (Saha et al., 2017).

4 Iot Based Traffic Management System

The smart cities are now using the IoT in their traffic system. The problem of congestion and unforeseen events has been reduced by the integration of metal loops in the road that has data points that send a report about such events. The metal loop has sensors on it and street cameras allow the information transfer to major operation rooms (Alzoubi et al., 2019). The operation room staff analyze the data with Big Data Analysis's help and organize it under priority by utilizing a machine learning approach. The operation room then transmits the relevant information to the traffic lights integrated with IoT to change traffic direction away from the site of the incident or make room for other traffic in congestion. The digital display boards notify the traffic about the speed light and measures required to be taken for current road conditions (Misbahuddin et al., 2015).

The emergency vehicles are also caught in the congestion and have fatal consequences. This problem is also resolved by marking such vehicles with infrared (IR) beamers that provide IR signals. This method allows the release of signals that are taken by road cameras and they send it to the main room where the data is categorized and transmits orders to switch traffic lights immediately (Alzoubi, 2021a, 2021b; Miller, 2021).

The other most notable traffic problem is the parking space needed. It is also dealt with the IoT at the parking space. The counter for parking has sensors that show whether there is an empty parking slot. Such sensors need very little power because they are used only if any parking is offered (Mehmood et al., 2019). Moreover, they

also require less bandwidth and every sensor has its routing capabilities which allow the traveling of data to network doorway by combining such networks. This is why a network gateway is not required in parking sensor limits. The sensor network nodes will create a mesh and use the data of neighboring nodes to reach a network gateway (Alsharari, 2021). This final entrance will transfer information to a cloud application or computer and enables drivers to be seen in real-time. It allows safe streets, reduces congestion on the road and lower rates of the accident. It reduces the money spent on the roads fixation and provides an excellent boost to the economy (Saha et al., 2017).

5 Iot Based Deep Reinforcement Learning

Deep learning is the most effective machine-based learning approach which offers purpose classification, estimate, and forecast functions. Reinforcement learning provides a decision-making process and optimal control in which the software agents allow optimal actions policy learning on the states set in the environment (LeCun et al., 2015). The deep learning model is used for approximation of action values in applications where states number is quite large. The systems that merge reinforcement and deep learning are gaining considerable attention in smart cities' different applications (Ghazvini et al., 2020; Memon et al., 2020).

According to research carried out by Nemati et al., a deep reinforcement learning algorithm is used for learning the actionable policies to provide the medicines optimal dose such as heparin (Nemati et al., 2016). The researchers utilized the dosage trials sample dataset and its outcomes from various electronic medical records (Alnazer et al., 2017). They used Hidden Markov Model for the Q-network and state estimation with the neuron's two layers. The dosage agent learns the optimal policy by enhancing the entire reward, that is the overall time fraction when the patients are within the therapeutic range of activated Partial Thromboplastin Time (aPTT).

The machine-based approach is also applied in the vehicle image classification. Researchers proposed the Convolutional Neural Network (CNN) model combined with a learning component that guides where to look in car key parts image. The focused image created by the CNN model is measured with the reinforcement learning agent reward of learning identification of following visual attention part in the image. A similar effort is reported by Caicedo et al., where the focused attention on the object localization is reported through the use of a deep reinforcement learning approach (Caicedo & Lazebnik, 2015).

Li et al. have used the deep reinforcement learning approach in controlling the time of traffic signal to provide good signal time (Li et al., 2016). The proposed model has the four layers stacked auto-encoder neural network that works to estimate Q-function. The two actions defined include: Change lanes and allow other traffic to move through the intersection or stay in the current traffic lane. The reward function is represented by the difference in absolute value among opposite lanes length (Akhtar

et al., 2021; Aziz & Aftab, 2021; Mehmood, 2021). Such a result shows that the model works well than the conventional approach.

Resource management is one other task that utilizes DRL. Mao et al., formulates job scheduling problem with the various resources demand as the deep reinforcement learning procedure. In this method, the primary aim is the reduction of the slowdown of jobs. The reciprocal job duration is defined as a reward function (Mao et al., 2016). One other application where deep reinforcement learning plays the most critical role is the innate understanding of the language for text-based games. The researchers used the long short term memory networks for the training of agents with the useful text descriptions presentation along with the deep Q network for approximating the Q functions (Radwan & Farouk, 2021). Some other fields, such as energy management, have also included the DRL for improving the use of energy.

Indoor localization.

Only one group of researchers have utilized the DRL for the indoor localization services and the most promising approach found in the Relative Signal Strength (RSS) (Hasan et al., 2019; Islam et al., 2017). However, it has come up with some challenges in deployment, including device diversity and fingerprint annotation. Different machine-based learning approaches have been studied including transfer learning, SVM, neural networks, Bayesian-based filtering, and KNN. It is showed that for the Bluetooth low energy RSS fingerprinting based positioning applications, the estimation to decide that if the device is within the room provides quite reliable results (Islam et al., 2020). The researchers report the indoor based positioning results reading. They have studied three methods of accuracy including Centroid positioning, three border positioning, and the least square estimation. There are four BLE stations in the 6×8 sq. meter classroom testing area, and the LSE algorithm is applied that showed accurate positions compared with other methods (Nurelmadina et al., 2021). However, all three algorithms showed complete satisfaction (Kajioka et al., 2014).

Museums are best for utilizing BLE to offer location awareness as the building does not permit changes due to its protection rules. Researchers have established the method for making an interactive display of culture in the museum by BLE examples combined with the image recognition wearable device. This device provides localization to receive the signals of BLE for identifying the room where it is present. The device also recognizes artwork with the image processing facility. A combination of artwork identifier and closest beacon identifier is installed in the processing center to earn relevant cultural material (Al Ali, 2021; Eli, 2021; Kashif et al., 2021; Lee & Ahmed, 2021).

Wang et al. (2015) provide a system named DeepFi that uses a deep learning method for locating the indoor positions based on channel state information. This system includes the online localization and offline training phase. In the offline training stage, the researchers used deep learning for training total weights as the fingerprints upon the basis of before kept CSI. Improved localization accuracy of 20% was reported in the laboratory and living room settings. As their CSI approach use is only restricted to the WiFi network, not every network interface card supports the measurements from wide channels.

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Joined semi-supervised learning, deep learning, and the extreme learning machine to the unlabeled data for study classification phases and feature extraction performance for the indoor localization (Gu et al., 2015). They generated the accurate classification and higher abstract features by combining the semi-supervised learning and deep learning network in which the learning machine can raise the learning process speed. The results showed that deep learning enhances fingerprint accuracy by 1.3% for similar dataset training compared to the shallow learning method. The unlabeled data also showed a positive effect over accuracy. When the approach is compared with other methods, the approach has raised the accuracy level to 10%.

In another study conducted by Zhang et al. (2016), the group utilized the WiFi localization approach by utilizing deep neural networks (DNN). The four-layered deep learning model was utilized for the extraction of features from the WiFi RSS data (Wang et al., 2016). Within the approach, the researchers used Backpropagation and Stacked Denoising Autoencoder for the preparation phases. In the level of online positioning, DNN based location is additionally advanced by part of HMM. The experiments indicate that the neurons and hidden layers pose an effect directly upon localization accuracy. Raising the number of layers provides better results but when the network is deep, the results degrade. According to their results, when three hidden layers each layer carrying 200 neurons is used, the model showed optimum accuracy.

One other researcher has also utilized an artificial neural network for the localization of WiFi fingerprints. They used the localization approach, which used this artificial neural network and the clustering method based on affinity propagation. With help of affinity propagation clustering, the ANN model training is quick whereas memory overhead reduces. It also showed better positioning accuracy in comparison with baseline methods (Ding et al., 2013).

One other study has used the deep belief network as the localization approach based on ultra-wideband signals fingerprinting within indoor atmospheric conditions. The channel impulse response parameters were utilized to provide the dataset for the fingerprints. When the model was compared with the other methods, the DBN has shown better and improved localization accuracy (Luo & Gao, 2016). This work was further expanded by Zhang et al. (2016), where they used a deep learning model along with the regression model for learning the discriminative features automatically from wireless signals. The softmax regression algorithm is used for performing the activity recognition and device-free localization. It has been reported that the method enhances the accuracy of localization up to 10% when compared with the other methods.

6 Iot Based Underwater and Wireless Sensor Network

The IoUT is defined as the chain of smart interconnected underwater objects that are now defined as the IoT labeled underwater and wireless sensor networks (I-UWSNs). The smart objects have different sensor types such as autonomous underwater vehicles, ships, buoys, watchman nodes, etc. That is why, the I-UWSN is expected to

carry various practical applications, including monitoring the environment, disaster prevention, and underwater exploitation (Alshurideh, 2022; Cruz, 2021; T. Ghazal et al., 2021a, 2021b; Hamadneh et al., 2021a, 2021b; Shamout et al., 2022).

There are different ways of implying sensor nodes within I-UWSN for these purposes. The nodes are either deployed randomly or in the tree structure or grid form. For providing reliable communication, every sensor has communicational, computational, and intelligence capabilities in dealing with smart city environments. Different routing protocols are utilized for providing effective and reliable communication in the smart underwater environment. One of them is the self-organized underwater wireless sensor network that utilizes tree topology to deploy nodes. The dynamic address is assigned to every node for hierarchical, hop count, and identification level. For new node addition at each level, it only requires a parent address. It also resolves the problem of node isolation as well as the close loop (Alshurideh et al., 2020; Lee, Azmi, et al., 2022a, 2022b; Lee, Romzi, et al., 2022a, 2022b).

6.1 Topology Controlled Protocols

Another reliable routing protocol is the topology efficient discovery that can reduce the time overhead and accurately evaluating the reliability of the link. This protocol relies upon the time window that is allocated for transmission within which the time slot has been defined for the nodes for transmission of one or different packets.

One other work measures the reliability of the link. The model supports multiple-input multiple-output (MIMO), code division multiple access (CDMA), and Binary Phase Shift Key (BPSK) communication system. Geethu et al., used the depth-based routing protocol as mentioned above, which improves data reliability. This is an efficient approach for handling dynamic networks (Diamant et al., 2017).

7 Conclusion

Modernization is at the peak at this time as rural to the urban movement of population has been greatly observed, shaping people's lifestyle. More smart cities are in process that is expected to accommodate such a large number of figures. Several developments are undergoing in different countries regarding Smart City. The smart city is the shorthand for the technology-based services within society, which means the ICT (information and communication technology) is crucial for the implementation. The justified use of IoT based machine learning approaches has been proved valuable in various effective ways, including IoT-based WSN for reducing energy consumption. IoT based Water Supply System, IoT based traffic management System, and the IoT based Underwater and Wireless sensor network.

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Machine Learning Approaches for Sustainable Cities Using Internet of Things

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Abstract As these tech-based cities continue to emerge, so do the experts dive deeper into the research on the various Internet of Things methods, and the most plausible machine learning techniques. What is Machine Learning? What role does it play in IoT-based platforms? How does it contribute to the continuous advancement of smart cities? What is IoT? How has it changed the lives of urban households residing in smart cities? How does IoT interact with machine learning to ensure more efficient cities? This research paper delves into the various existing literature in a bid to respond to these questions as effectively as possible. It looks the research that have handled issues of IoT and machine learning. The search criteria are set out in the methodology section that has inclusion and exclusion criteria for the articles considered in this paper. There is systematic evidence showing that IOT and machine learning can be used for the management of the future cities. The results suggest that IoT and machine learning are at the core of the development, maintenance, and

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_108

sustainability of smart cities. Further studies are required on how IOT can be securely used by analysis some of the security vulnerabilities faced by these systems.

Keywords IOT · Machine Learning · Digital Cities

1 Introduction

Humanity has advanced its technologies to the extent that they have become an integral part of our lives (Al Kurdi et al., 2020; Alshurideh et al., 2019; Kurdi et al., 2020). A few decades ago, the idea of having a city whose main operations and services are run and operated by modern technology seemed like something out of a sci-fi movie. Today, however, smart cities are mushrooming in different countries across the world, including Singapore, the UAE, Japan, Italy, the US, and the UK. A few decades ago, the idea of a city that utilizes different electronic sensors and methods to gather and analyze data seemed outlandish (Ismail et al., 2019). Today, however, the idea of smart cities is fast growing in popularity, as countries like Japan, the UK and Italy lead in the digitization of their City Asset Management Systems. Cities like Tokyo and Milan have been remarkably digitized in terms of traffic control, power plant operations, transportation systems, water supply networks, and waste management, and so on (Habibzadeh et al., 2019). With technology becoming not only more advanced but also accessible to the masses, smart cities are going to be part of the urban planning agenda in many countries. Since the concept of smart cities is a novel idea, there is no consensus on what the exact definition of the term 'smart city' is (). However, experts' scholars, and pundits agree on the key characteristics of smart cities. For instance, they all agree that smart city applications utilize the information and data gathered in many processes, such as the management of assets, services, and resources (Chhaya et al., 2018). In all these cities, the primary reason for the use of technology in the management of resources is to improve the quality and efficiency of services (Al Alshurideh, 2022; Alzoubi & Aziz, 2021; Batayneh et al., 2021; Hasan et al., 2022). This research paper seeks to explore the role of internet of things (IoT), electronic sensors and machine learning (ML) in the development, improvement, and maintenance of sustainable smart cities.

2 Research Methods

A. *Research Methods and Materilas*

The work was done by use of the secondary sources through a systematic review of the published papers. This method was widely used by authors lately as seen in the following paper (Ahmad et al., 2021; Al Khayyal et al., 2021; Almazrouei et al., 2021; Alshamsi et al., 2021; Aisha Alshamsi et al., 2020; AlShehhi et al., 2021; Assad & Alshurideh, 2020; Mehrez et al., 2021). Only credible papers

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that have been published within acceptable journals were selected for this work. Papers that have been peer reviewed and published in the IEEE journal were considered.

B. *Time Frame*

The researcher considered only the papers that have been published in the past 10 years based on their relevance to the research. The timeframe used in the references to achieve this research was to include papers published in 2010 to the once published in 2020.

C. *Search Key Words*

The key words that were considered here include IOT, Internet of Things, Machine learning, IOT architectures, learning-based algorithms, IOT security, Secure communication, and IOT taxonomy.

D. *Inclusion Criteria*

The materials must be available within the IEEE websites. The information must be available within three clicks and that was to ensure that the selected website meets the useability criteria. The top five websites when searching using the phrases selected and that was to ensure the researcher uses the once that are most visited. Work from peer reviewed journals to ensure high quality of the articles selected.

E. *Exclusion Criteria*

The type of website where the materials was located was a major exclusion criterion. Websites that do not support academics content, are political in nature, supported by organizations with biases were excluded from the list and the researcher would not select articles based on those sites. The sponsored websites as well as advertisement were excluded when it comes to website selection. The website providers can make payments to make their site appear within the search engines results, the above has a potential of biases hence must be excluded in the website selection. Duplicate work was excluded to reduce the time needed to carry out the research.

F. *Research Queations*

i. What is the role of internet of things and electronic census in the development and maintenance of smart cities?
ii. What role do the different machine learning approaches play in the improvement of the effectiveness of smart City applications?
iii. How will the internet of things revolutionize the lives of the thousands of households living in smart cities?

3 Literature Review

Broadly, the term smart city refers to an urban center or area that applies different electronic sensors and methods to gather data from devices, buildings, citizens, and

city assets (Sayakkara et al., 2019). These smart city applications analyze such data and use it to ensure more efficient and timely services, and real-time responses to various arising issues. In a smart city, the applications based on internet of things (IoT) gather and process data, which is used in the management and monitoring of information systems (IS), libraries, schools' hospitals, services, traffic transportation systems, water supply network, waste management systems, power plants, crime detection, and other community services (Shin, 2019). In smart cities, the internet of things (IoT) offers a platform of interaction, where the city authorities can directly interact with the residents, as well as the city infrastructure. Specifically, the platform on which smart cities run is based on the interaction between information and technology (Kortesniemi et al., 2019). In other words, in smart cities, information communication technology (ICT) is applied in the enhancement of performance, quality and interactivity of all urban services (Park et al., 2018). It is also used as a tool for controlling resource consumption and reducing costs, by improving the contact between the citizenry and the authorities. In smart cities the smart applications are used in managing the urban flows and sharing real-time responses.

Infrastructure Development, while these variables may vary from one context to another, there are some primary defining ones, including infrastructure development. Smart cities prioritize the optimization of infrastructural development to improve and support social, economic, cultural and urban development (Hahm et al., 2016). This explains why smart cities are associated with improved communication channels to connect such essential services as entertainment, housing, business, and telecommunications, among others. All these services can be linked through advanced technologies that enable a city to develop and grow.

Competitive Environment**:** Smart cities endeavor to create a highly competitive environment through information and communication technologies (ICT) and planning with the aim to expand urban sectors, which enhances the growth and development of businesses and the enhancement of the city's social economic performance (Park et al., 2018). In addition to promoting healthy competition, smart cities are sustainable and inclusive because their main strategic element is to achieve sustainability to find participation drivers, use renewable energies, and create better consumption habits, all with the aim to preserve the natural resources and to take care of the urban environment.

Protection and safety for the residents and ICT incorporation. The peace of mind of the residents goes together with new and emerging technologies. Security cameras are located all over the urban territory to ensure that the people's lives are safeguarded (Bairagi et al., 2016). These cameras and surveillance systems are accompanied by superior public lighting, and an effective system of surveillance (Ismagilova et al., 2020). Additionally, smart city authorities run processes for identity verification to minimize irregularities in the various dealings and settings (Alzoubi et al., 2021) Most importantly, the city residents get to receive instant responses to emergency calls regarding any accidents or domestic incidents, or anything related to the health of the citizens.

Ecological concerns: In the modern world, the environment keeps suffering due to unlimited human activity and other factors, which may be directly associated

with health hazards. Smart cities have effective environmental leaders, whose main concern is to create recycling and ecological mechanisms to enhance the quality of air and the general surrounding, and to protect them from further contamination (Rayan et al., 2019). One of the main aims of the smart cities, therefore, is to reduce the carbon footprint of the entire city to support its sustainability goals. When polluting gases are reduced, green spaces such as public parks, will be better preserved and less contaminated (Kouliaridis et al., 2020). As mentioned earlier, recycling is one of the citizens' daily routines. Smart cities have minimal or no problems associated with water collection and supply.

Participation and Open Innovative Processes. Overall, it has been established that smart cities use Information Communication Technologies (ICT) to adapt and innovate and increase their capacity to respond more promptly and effectively to the ever changing circumstances of the city by enhancing its intelligence (Erdin et al., 2015). Also, these cities use ICT to engage and interact effectively with the residents in decision-making and governance using a participation and open innovation processes. They also engage with the local people with the aim to improve the city's collective intelligence, as well as that of its institutions and organizations through a governance (Kreso et al., 2021). Here, the emphasis is on the participation of citizens and the core design of the cities with government and public efforts working together (Jamshidi et al., 2020). Lastly, smart cities apply ICT to ensure more efficient utilization of public infrastructure, including built environments, roads, and other physical assets, through data analytics and artificial intelligence (AI) to support a robust economic, cultural, and social development.

4 The Internet of Things (IoT) in Smart City Development and Maintenance

The internet of things (IoT), a key component of smart cities, refers to the interconnectivity of various physical devices through an internet platform. The interconnected digital devices can be controlled remotely using different telecommunication devices, including mobile phones (Wang et al., 2016). The internet of things (IoT), in more straight-forward terms, is the connection between diverse physical devices linked to and in constant communication with each other over an online based platform. A good example of a common application of internet of things (IoT) is the collection and analysis of weather fluctuations and changes (Zou & Wang, 2016). One of the most significant contributions of the internet of things to the development and improvement of smart cities is that it offers low-cost management of assets. For instance, the use of internet of things (IoT) eliminates or mitigates the need for human labor in various services (Rabbachin et al., 2015). Also, the internet of things offers fresh insights that can further revolutionize how the city functions. Research has demonstrated that the internet of things (IoT), through its intricate data analysis capabilities, has been able to unveil new insights such as establishing relationship

between industrial production and the weather (Almeida et al., 2015). Such insights and relationships demonstrate the ability of internet of things (IoT) and other aspects of technology to improve how cities function.

4.1 Smart Energy

One of the most critical areas of research that is related to the internet of things (IoT) is smart energy because it is important in ensuring the reduction of overall power consumption. Smart energy provides high quality and highly affordable ecologically friendly energy (Gnad et al., 2019). The concept of smart energy includes a broad multiplicity of energy and operational measures, which include smart leak monitoring, smart energy applications, and renewable energy resources, and so on (Fernando et al., 2020) Deploying a smart energy grid or using smart energy, implies a critical re-engineering of the services within the city. The smart energy grid is one of the most critical applications of the concept (Sayakkara et al., 2019). The smart energy grid includes a broad diversity of high-speed time series data in the monitoring of devices. To manage this kind of data, experts brought in a method to analyze and manage the time series information so as to make them organized on demand (Abawajy et al., 2018). Additionally, the smart energy grid is expected to grow in complexity into the foreseeable future(Ahmed et al., 2021; Al Naqbia et al., 2020; Al Suwaidi et al., 2021; Almaazmi et al., 2020). Therefore, experts propose a simulation system for testing the novel concepts and optimizing approaches and forecasting or projecting future consumption. Another critical application of smart energy grids is seen in leak monitoring systems (AlHamad et al., 2022; Alzoubi et al., 2022; Shamout et al., 2022). The main function of these systems is to model a gas or water management system that has the capacity to optimize the consumption of energy resources (Kaur & Sharma, 2015).

4.2 Smart Energy

Mobility is one of the most essential and critical aspects of any urban area. Through the internet of things (IoT) city authorities can enhance the quality of life for people. Smart mobility can be evaluated from three dimensions. The first dimension is traffic control. The optimization of the flow of traffic through the analysis of sensor data is one of the key elements of the city's mobility (Hosseinian Far et al., 2020) For effective control of traffic, data will be gathered from road cameras, cars, and counter sensors installed on the city's roads. The second dimension of smart mobility in cities is the use of autonomous vehicles. The internet of things (IoT) is expected to have numerous effects on how cars are operated. The most critical issue is about how the internet of things can enhance other vehicle services (Alzoubi et al., 2020a, 2020b). Wireless connections and internet of things (IoT) sensors make it easy to monitor the

performance of vehicles and to create self-driving vehicles. With the data gathered from the automobiles, the most congested roads can be predicted enabling the city and traffic authorities to make decisions that will significantly decrease congestion on the popular roads (Alshurideh et al., 2022; Lee, Azmi, et al., 2022a, 2022b; Lee, Romzi, et al., 2022a, 2022b). Self-driving automobiles can enhance the safety of passengers because they have the capacity to monitor and detect the driving of other motorists on the road (Zhang et al., 2017).

Regarding smart mobility, the last dimension is that off public transportation. The internet of things (IoT) can improve the system of public transportation by offering precise routing and location information to a city's smart system of transportation (Din et al., 2019). Also, it has the capacity to assist the city's passengers in making more informed decisions in their schedules, and to decrease the amount of time wasted. There are various perspectives on how to construct smart city public transportation systems (Joghee et al., 2020). The transportation systems in smart cities need to manage various types of data, like traffic and vehicle location data (Alhamad et al., 2021; Ali et al., 2022; Hanaysha et al., et al., 2021). Public transportation systems in smart cities should be designed in such a way that they are real-time oriented. This will help them make more informed decisions and prepare appropriate responses in real time. Also, they can use historical data analysis through the various machine learning methods (Gupta & Gupta, 2018).

4.3 Smart Citizens

The use of internet of things in smart cities covers a wide range of aspects in human lives, including the monitoring of crimes, the management of the environment, as well as the monitoring of social and public health (Park, 2021) All these components are fundamental and vital for human life within the urban settings. Additionally, making significant progress in technology is sure to improve the security status of the city (Alzoubi & Ahmed, 2019; Alzoubi & Yanamandra, 2020). Close monitoring and surveillance dedicated to crime will also have significant contribution to the citizens overall public and social health (Alnazer et al., 2017).

4.4 Urban Planning

Urban planning is yet another critical feature in smart cities because it helps them attain long-term goals and decisions. Since the environment and the city play critical roles in human life, achieving quality decisions is critical in this context. By Gathering data from citizens, devices, and the various sources in the city, it becomes possible to make effective decisions regarding the city's future. Urban planning refers to the process of making decisions that affect the city's functionality, design, and infrastructure. The internet of things (IoT) is highly resourceful in this context because

through the smart analysis of a cities data the authorities can predict those parts of the city that will be more populated or crowded in the foreseeable future and to come up with solutions for the possible problems (Alzoubi & Aziz, 2021; Hamadneh et al., 2021; Hanaysha et al., 2021). A combination of effective urban planning and the internet of things (IoT) will have a major impact on planning future improvements to infrastructure (Syam & Sharma, 2018).

5 Machine Learning Approaches, IoT and Data Analytics for Smart Cities

Machine learning (ML) is one of the most celebrated modern innovations that has assisted human beings enhance not only numerous professional and industrial processes, but also improve everyday living. However, the term 'machine learning' has not been assigned universally accepted definition, but it is generally agreed that machine learning is a subclass of the broader field of artificial intelligence, which concerns itself with using statistical methods to create intelligent computer systems with the capacity to learn from historical data and databases. Presently, machine learning (ML) is widely applied in diverse industries and fields. For instance, machine learning is used in medical diagnosis, classification, prediction, image processing, regression, learning, and association and so on (Ali et al., 2021a, 2021b; Alnuaimi et al., 2021; Alzoubi et al., 2021). The intelligent computer systems based on machine learning algorithms have the immense capacity to learn from historical experiences and past data without supervision. Machine learning applications produce results and make projections based on past experiences of similar nature. Machine learning is considered one of the most remarkable breakthroughs in the broader spectrum of artificial intelligence. While machine learning comes with some frightening implications, its applications are some of the ways through which technology can ultimately improve human lives.

5.1 Machine Learning Internet of Things and Data Analytics for Smart Cities

The transformation of big data analytics, along with the internet of things (IoT) machine learning (ML) has helped various places around the world realized the idea of a Smart City. The idea underlying the concept of a smart city is to ensure effective rendering of services to the citizens and people dwelling in the city through advanced data analytics and technologies (Sharma & Arya, 2015). In this regard, the data analytics focuses on the data gathered by the various internet of things (IoT) systems and electronic sensors. The extent to which a city is smart can be determined by initiatives on environmental issues, technology-driven infrastructure, smart public

transport systems, and the utilization of technology in reduction of crimes, and the use of technology to manage wastes and water, and so on (Alshurideh et al., 2020; Alzoubi et al., 2020a, 2020b; Ghazal et al., 2021). In the context of smart cities, one of the machine learning (ML) techniques that is considered highly effective in gaining insights from the various gathered data is deep learning. Deep learning can be used to make sense of the patterns from the data collected, and to predict or to classify the data.

With rapid and widespread urbanization efforts and the unprecedented rates of population growth in cities, smart cities are becoming highly favored options, as they can offer a better lifestyle to the citizens and residents by applying innovative technological advancements. The smart cities highly depend on actuators and sensors to gather large volumes of information and data. This data is analyzed and applied in the extraction of potentially beneficial decision-making information. However, because of some limited capacities, only a small percentage of the data collected in the smart city is used because of various reasons (Mehmood et al., 2019). For instance, the data generated or collected may be highly diverse and noisy. Machine learning and artificial intelligence are known for their capacity to handle high volumes of error-prone or messy data. Advanced machine learning applies algorithms that can exploit the availability of both labelled and unlabeled data to provide effective personalized services and resource management in smart cities. The processed data or information can be used in numerous daily applications including prevention of pollution, management of healthcare, and designation of efficient transportation, stronger security measures, and better management of energy (Aziz & Aftab, 2021; Cruz, 2021; Radwan & Farouk, 2021). Academia, research and practice have demonstrated that the application of machine learning (ML) in the leveraging of internet of things (IoT-based techniques) have consistently proven to be more sensitive, accurate, cost-effective, and timesaving (Malche, 2019).

Machine learning has proven to be a proficient and powerful technology data has revolutionized how big data is analyzed. In smart cities, huge amounts of data are gathered from smart devices and sensors around the city (Al-Fuqaha, 2018). Deep learning and machine learning collectively have the potential to significantly enhance the quality of life through the application of diverse domains (Al Ali, 2021; Alzoubi, 2021a; Lee & Ahmed, 2021). Deep studies have been and are still being done in this area to reveal and explore more useful applications of deep and machine learning. Machine learning provides the computer systems the ability to learn automatically by accessing information and data provided and applying it in its self-learning process. This gives the computer systems and the internet of things (IoT) by extension, the ability to improve from experience without any programming efforts by humans (Akhtar et al., 2021; Eli, 2021; Kashif et al., 2021). Coined by Arthur Samuel in 1959, the term ‘machine learning’ has become a central area of focus in the planning of large smart cities as urbanization keeps growing by the day. With the data overload from the smart devices and sensors in smart cities individual reviewing may not be possible which makes it necessary to have a system that can not only learn but improve by itself from historical experiences (Napiah et al., 2018).

Machine learning requires a dynamic general and continuous learning mechanism as the smart city undergoes evolution in its operating environments and applications. Therefore, there is a need to explore the capacity and potential of machine learning and large amounts of data in the creation of personalized services in smart cities (Chilamkurti, 2018). In a nutshell, machine learning, and deep learning specifically play a critical role in ensuring improved efficiency in smart cities. The concept of machine learning is undergoing rapid evolution as an outcome of the improvement of the various algorithms, improved computer networks, upgraded approaches of capturing data, innovative sensors, and heightened interest in customization (Elhoseny, 2018). The primary objective of machine learning algorithms is to effectively interpret the information and data that has never been observed before, and to make projections beyond the samples used in training, such as real-life data (Alsharari, 2021; Mehmood, 2021; Miller, 2021). The precision and accuracy of the machine learning algorithms can be further improved by increasing the volume of training data given so as to strengthen or to reinforce their learning capacities.

5.2 Machine Learning Approaches for Smart Cities

Machine learning approaches are widely categorized into three main classes, according to the nature of the learning feedback or signal available in a system of learning. These three categories include the supervised, unsupervised, and semi-supervised approaches. The semi-supervised approaches refer to a combination of the supervised and unsupervised types. The semi-supervised algorithm works by applying huge amounts of input data with only a small section of it labelled as 'training data.' In a similar approach, referred to as reinforcement, learning offers feedback, which guides the computer programs in its interactions with a highly dynamic environment. The unsupervised algorithms work through self-organizing and recognizing concealed patterns in input data that is unlabeled to form neural networks (NN) through unsupervised algorithms of machine learning (Guergov & Radwan, 2021; Khan, 2021; Mondol, 2021). It has the capacity to process data and information without any error signal to assess and evaluate possible solutions. Unsupervised learning is important because to annotate large sets of data like speech recognition can be quite expensive and cannot be evaluated. Clustering is a classic example of unsupervised learning (Alzoubi, 2021b; Farouk, 2021; Obaid, 2021).

6 Performance Evaluation

A detailed review of the existing literature suggests that IoT and artificial intelligence are some of the most powerful forces on the list of technologies revolutionizing the modern idea of a city. Particularly, research studies suggest that machine learning is a critical component in the IoT program, when a city wants to achieve better

communication technology. Among others, the key findings from the research papers reviewed here include:

i. From Kortesniemi et al. (2019) the work characterized the machine learning problem in cognitive radios and showed the value of artificial intelligence when it comes to attaining real cognitive commination systems. The machine must be well advanced to levels where they can aid in decision making. The decision levels algorithm developed for the machine will help in classifying different observation models. It possible to have unsupervised algorithms that can be secure for the IOT. The challenges experienced within the learning machines algorithms should be known and addressed.
ii. Overall, the application of machine learning in the efforts to leverage IoT based methods, have consistently demonstrated to be more time saving, accurate, cost-effective and precise (Ismail et al., 2019). The ability of machine learning to process heavy amounts of data at once and with remarkable accuracy makes it a primary component in successful IoT based systems in smart cities. Particularly, the findings of most scholarly research studies suggest that busy systems as traffic and transportation systems need superior machine learning approaches because accidents can be fatal and costly.
iii. Research findings of Chhaya et al. (2018) study suggested that one of the most important aspect of machine learning is the unique ability to process huge volumes of data, and to allow machines to learn from past events. By so doing, machine learning gives researchers the opportunity to reevaluate standards in several sectors hence promoting
iv. Continuous improvement.
v. The internet of things will offer remarkable contribution on the developments of smart cities and maintenance from references (Wang et al., 2016; Zou & Wang, 2016). IOT will offer connections between the physical devices that are linked to it and the online platforms that are used for city planning and maintenance. The internet of things is now used in smart city systems such as those for the collection and analysis of weather and that has a potential to other areas such as city health status.
vi. Machine learning applications can be adopted to special wire sensor networks which can be incorporated in the management of smart cities (Elhoseny, 2018). It will be possible to have special networks that can be used for the transformation of the big data analytics together with internet of things and machine learning. Once integrated the smart cities can benefit through effective rendering of services to the residents. Data would be gathered by different IOTs and machine learning will offer the computer systems the capabilities to learn automatically and apply the experiences within the learning process of managing the cities. They will be continuous improvements on the way the cities are going to run and managed.
vii. From Syam and Sharma (2018), IOT facilitates integration between physical objects and sensors that are responsible for providing commination between them without having any human interventions. Despite their good algorithms

they are faced with different security vulnerabilities that should be addressed to have temper proof systems. Lightweight schemes are the most favored systems to solve the security challenges of IOT. Other new measures should be sought since the security vulnerabilities keep on changing.

viii. Also, Sharma and Arya (2015), findings firmly suggest that one of the sectors that heavily relies on IoT and machine intelligence is healthcare. In addition to healthcare, machine learning improves the quality of life by revolutionizing transport, security, law enforcement and crime management.

ix. From Nia (2021), machine learning, and the internet of things change how people respond to disasters and emergencies by gathering analyzing and disseminating important decision-making information. IOT and machine learning are tools that can be incorporated towards managing the cities security systems.

x. Based on the findings from Bairagi et al. (2016), IoT and Machine intelligence will alter the socio-political climate of the smart cities because the relationship between the government and the citizenry will be strengthened by inclusive and participatory decision making. The IOT will rely on information faster and Machine learning utilized to make the required analytics.

7 Conclusion

In conclusion, IoT, electronic sensors and machine learning are revolutionizing our idea of mega smart cities. These AI-based concepts have revolutionized how people go about their everyday lives. As smart cities continue to emerge, the word is going to change in a broad number of ways. First, ICT is going to reduce the number of people needed in the running of such services as water and waste management, security and surveillance, transport sectors, traffic management and industrial operations, among others. This paper has effectively responded to the research questions because it has demonstrated the centrality of IoT, electronic sensors and machine learning in the designing and running of smart cities, such as Tokyo. These concepts contribute immensely to the fast and reliable conveyance of information and data among the relevant people and departments, for effective and well-informed decision making. Machine learning's biggest contributions include its almost limitless capacity to gather and process multiple volumes of data at remarkable speeds, and the reality that it allows machine to learn and contribute to the improvement of the city systems. Overall, IoT and Machine learning are gradually becoming seamlessly interweaved with the everyday lives of the citizens living in smart cities.

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DDoS Intrusion Detection with Ensemble Stream Mining for IoT Smart Sensing Devices

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Abstract Security threats in the Smart City Systems are becoming a challenge. These Smart City Systems, generating Big Data, are a revolutionizing application of the Internet of Things(IoT). Data Stream Mining, which is an efficient way of

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_109

handling Big Data, is now of great concern. The acquired information is computationally expensive to process in terms of efficiency and runtime. Detection of suspicious activities on decentralized servers, generating and computing massive data streams requires time. Moreover, several stakeholders should be engaged to train the heterogenous malware data streams in the level of service application. Small experiments can be performed on the functionality of Batch ML on IoT datasets with available heap size resources. Among these candidate datasets, a little contribution has been already represented on the Mirai Attack. This research aims at the study of Data Stream Mining algorithms. Owing to the accuracy and interferences of the measurement, these algorithms are able to handle the non-hierarchical and unbalanced datasets similar to the Mirai Attacks. No single method can solely improve these critical standpoints. Thus, an Ensemble technique should be implemented. According to our study, a pool of meta or selective classifiers that interact based on the temporal Data Mining swiftly can outperform others. The maintainability and security concerns of such applications can be best fulfilled in meta-heuristics with the one-time scanning network approach for the recognition of the most frequent attacking pattern with the on-the-fly scheme. These are implemented in Create, Read, Update and Delete (CRUD) operations of the Big Data Systems.

Keywords Data stream mining · Ensemble active learning · Prequential learning · Mirai dataset · Security and privacy · Smart city · Wireless sensors · And internet of things

1 Introduction

The human mind is routinely sensing the reality of things through five sense organs. However, none of these senses can singularly result in the perception of objects in contexts such as planning, investigating, composing music, playing chess, or journalism while a mystic unconscious mind is incorporated in the aggregation of all those senses and builds the perception of the objects (Akhtar et al., 2021; Al Ali, 2021; AlHamad et al., 2021, 2022; Ali et al., 2021). Perhaps the human mind's neurons, evolving over thousands of decades, are capable of tree mining and associative rule reasoning ability. How a learning machine can similarly train from high volume streams, processed with distributed structure in parallel with other measurements, is an unanswered question. The combination of state-of-the-art sensor technology with

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Table 1 Sensor network characteristics

Details	Wireless sensor network data
Processing architecture	Distributed
Data type	Dynamic
Memory usage	Restricted
Processing time	Restricted
Computing ability	Low
Energy	Restricted
Data length	Restricted
Response time	Real time
Updating	High
Data flow	Continuous

IoT in which is rapidly penetrating human life is inevitable. In 2020, the number of connected things on the Internet exceeded 50 billion. Data Streams are typically dynamic such as time-series format and their memory usage and processing time are restricted to hardware and database servers' limitations (Ali et al., 2022; Alnazer et al., 2017; Alnuaimi et al., 2021; Alsharari, 2021; Alshurideh et al., 2022). Regarding the unbalance attribute, high missing and noisy percentual, the dataset exhibits a low ability for the computation therefore any structuring or classification for such data should be updated in on-the-sky responding time. Sensor Network characteristics are shown in Table 1.

Nowadays, tread events can be handled when more sensor nodes are connected through cluster-based routings. Therefore, there are principal protocols in the field of planning Wireless Sensors. These protocols are better in energy saving, result in a longer network lifecycle and higher network efficiency. Wireless sensors that are small, adoptable, cost-effective, energy-efficient, and secure play an important role in the management of security, monitoring, and privacy issues of IoT Systems (Alshurideh et al., 2020; Ali Alzoubi, 2021; Alzoubi, 2021a; H Alzoubi et al., 2020, 2022; Ghazal et al., 2021). Since sensors are relatively cheap and small therefore there is a restriction on their hardware resources like memory and CPU to process the detection log files and sensors should maintain the energy consumption and needed to operate on the simplest form of processors. Furthermore, the environment doesn't always allow us to have a constant sensor functionality in comparison to the wired sensor networks. Hence, there is an essentiality for the implementation of real-time Intrusion Detection Systems on groups with the least cost and energy consumption, which is working on the basis of a decentralized detection approach.

The importance of security is not hidden from any stakeholder on the Internet of Things. Today Artificial Intelligence is handling security more accurately and professionally. It fills the gaps of Internet of Things Systems against the form of robots that hijack their information for their own sake into other levels and increase the risk of stakeholders. Wireless Sensor Networks are working in hostile environments where fraud issues can easily happen in the physical layer (Sensor). IoT systems in

smart cities especially in applications such as electric power, health care systems, financial sector, and environmental disaster prediction (flood, tornado) can be the purpose of the attacker according to the level of damage they tend to bring to the public good. Similar to the aspect of term Internet advertisement and ransomware Web usage, in the Internet of Things Systems, malicious botnets are now threatening the privacy of the Users. Distributed Denial of Service (DDoS) attack is known as the most serious attack that transmits lots of data by taking up the bandwidth traffic. According to the reports published in the course of the pandemic on the DDoS attacks, there are 929,000 DDoS attacks in a 31-day (April–May 2020) with more than 2.8 TBPS bandwidth, and more than a thousand botnets are disrupting legitimate services like Amazon, eBay, Netflix, etc. or even public services (Alzoubi & Ahmed, 2019; Alzoubi & Aziz, 2021; Alzoubi & Yanamandra, 2020; Alzoubi et al., 2020, 2021). Unlike network layer (DoS (that occurs in the hardware such as I/O or Sockets, in the Distributed DoS (DDoS) attacks are performed from a legitimate request usually by a HTTP get command on a machined network. In contexts like Smart Cities and the Internet of Things, a middle-ware layer can be constructed to partly solve the above issue with located features' API architecture by semantic analysis of the code. It can be further extended not only by the Application level but also from the viewpoint of repository level which migrates the central cloud framework to Distributed Clouds (Fog Computing). An example of the Fog nodes clustering based on the Actors of different layer and applications are shown in Fig. 1.

A survey was conducted on the cyber criminal's behaviors and intension in order to develop a framework for IoT devices, applications, and Big Data Systems that require immediate awareness such as healthcare and public and financial services, who are threatened and lost control of their contents. The functional blocks and maps send the clustering results to actors by the implementation of the actors' model. This allows the users to contribute to the holistic and work for the sake of their prenatal network layers in the IoT. The attacks on the health, financial and public sector were reported that with the increasing demand on the performance of data mining the less traffic between the end cloud and the user can be gained. Table 2 presents the most important form of security and breach of the Internet of Things framework.

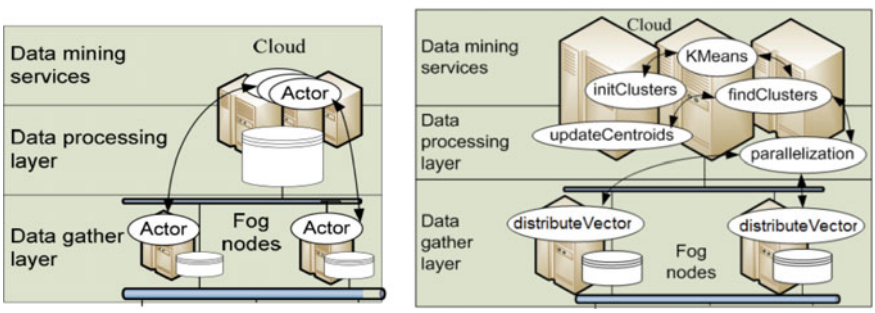

Fig. 1 Fog computing in the distributed architecture of IoT

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Table 2 Design requirements of security scheme

Security requirement	Integrity
	Confidentiality
	Availability
	Authentication
	Access control
	Prevent node replication or addition

In our proposed framework a packet payload has been utilized to discover if an activity is benign or attacked based on a network packet. After the training of the classification model (Intrusive user experiment) with attributes (IP and MAC address), Channel, Socket characteristics were imported to the data stream mining ensemble of different algorithms. A simulation was performed with density and weight-based ensemble in the MOA (Massive Online Analysis) software. The results were compared with the accuracy and false-positive rates for the batch dataset of the DoS attack. Secondly, detection of a network intrusion in the server even at the Application level by the implementation of a Test Case scenario is elaborated. Here, different CRUD operations, feature locations are acting on a defined number of Test Cases, although applied filtering, high level of penetration, and big sample size stand as a generalized and wide strict rule for the Internet of Things.

The paper is organized as follows. Section 2 provides a summary of the results and research pathway of the recent publications and introduce the implementation of Data Stream Mining and IoT systems in DDoS attacks of different applications. Section 3 presents the dataset and the designed experiment with the proposed Ensemble. Section 4 presents the results of the Mirai case study and the accompanying risk on the CRUD processes. Section 5 concludes idea of each of the Ensemble techniques and the future research for smart cities.

2 Literature Review

The application layer DDoS Intrusion Detection form a new trend in Industry and professional issues and are now of great interest scientifically and is practiced in many algorithms such as Markov-based wavelet singularities detection model, Flexibility induced Random Walk Graphs, and Novel method Bayes-based Entropy minimization Clustering in temporal data Mining. Temporal effects caused lots of computational costs and should not be ignored as well as other effects. One main advancement for the prediction of the Big Data System of IoT system was the application of very fast algorithms for the implementation in the AI, especially in the networking and service development cases which need the fulfillment of the requirement of security planning. Full implementation can be explained according to the CENELEC Standards procedure of software development which includes, System planning, software architecture planning, and Coding, Software Interface planning and static

testing, software/hardware compatibility, and dynamic testing like Black-Box, simulators, and documentation. IoT systems' inventions always extending to new tools and methods and in between the usage of data science in the area of mechanical, civil and mechatronics engineering are among the most wanted specialization in the field of technological development such as smart aircraft and satellites, high-speed hyperloop driverless System, smart cities and health care system. The very fast algorithms can also be implemented at best for smart cities for usages such as indoor application, edge computing, subways surveillances systems, smart commercial buildings, and also for the specialized sustainability measures where mounting of the temperature, humidity, and pollution level can be of great importance (Aziz & Aftab, 2021; Cruz, 2021; Eli, 2021; Farouk, 2021; Ghazal et al., 2021; Hamadneh et al., 2021; Nuseir et al., 2021).

The field of Stream Data Mining is very wide and it has become a very challenging task among computer science researchers. Even though Data Stream Mining is thoroughly analyzed in the literature, the concept of the method can be defined by major steps. It is started by the splitting of the incoming data into windows frame with fixed-width according to the hourly, daily, etc. bases. Then the summary of each window is used as input for the local clustering of the time-series. Two clustering algorithms are performed in this case one for the local clustering and the other one for the comparison and building of the proximity matrix. From this step, the data that is updated in an online manner is used for the clustering of the time-series, which is required by the users. Figure 2 is demonstrating the mining path in the data stream (Al Guergov & Radwan, 2021; Hamadneh et al., 2021a, 2021b; Hanaysha et al., 2021a, 2021b; Joghee et al., 2020; Salloum et al., 2020; Shebli et al., 2021).

According to the proposed diagram Data Stream Mining requires clustering (micro clustering) according to one of the following summarizations' algorithms: Growing

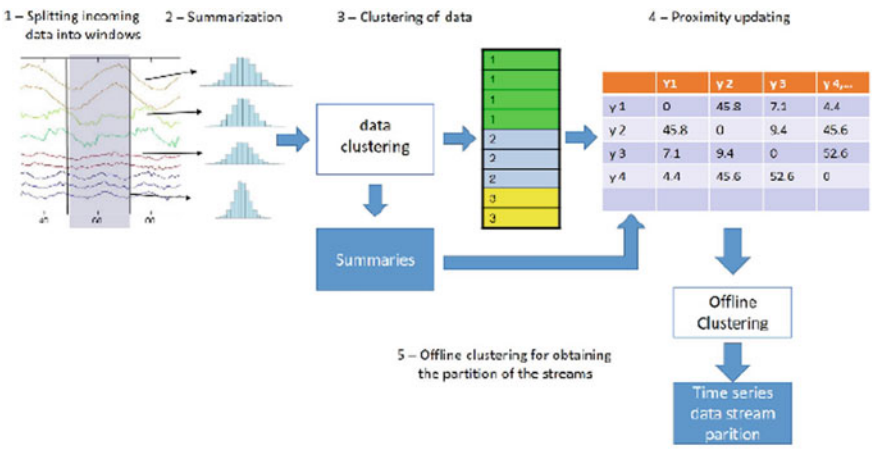


Fig. 2 Analyzing work plan

Neural Gas, hierarchical, Partitioning, density-based, and grid-based streaming method.

In a context such as Smart Cities, the memory and computational resources of the data streams are constrained by the hardware and software requirements, while the attractivity of the very fast decision tree is its temporal processing part of the dataset. The field of Stream Data Mining is very wide and it has become a very challenging task among computer science researchers. Detection of patterns, faulty and noisy data has been also widely discussed for the identification of patterns, planning of the IoT system safety, data repository, and security. There are normally two steps of cached-based meta- classification and main classification which can be organized in the mode. The principal idea behind the very fast decision trees (or Forest) is that it learns on the total macro view of an object and receive the knowledge from each singular Tree. The applications can be further extended in Jigsaw puzzles, Electrocardiogram Patterns and dynamic stock Market Data.

Incrementally Optimized Very Fast Decision Forest as an extension to the VFDT is reviewed on the Simon Fong Work on temporal data. Their work was mainly focusing on the iOVDFT algorithm and was published in two papers in 2017 and in 2018. This method was implemented to better evaluate the effect of the equal timeframe windows over a single day measurement of the sensors. After the implementation of the required MOA (Massive Online Analysis) component the chosen dataset on Intel Research Lab in Berkeley was evaluated (Part of the Weka Application). There are normally two steps of cached-based meta- classification and main classification which can be organized in the colorful visualization mode. Figure 3 represents the output of the Clustering module in two dimensions by MOA.

Obviously, for Sensor datasets, some attributes are not usually normalized, and their final cluster cannot visually distinguish as the above Generator based Visualization. This framework has no automatic way of normalizing the data and for this reason, the managing of the sensor from the data source is necessary when data classification is conducted using iOVDFT. But this makes it possible to look at the concept of Drift visually for the detection of the anomalies or abrupt changes in the Stream. It is anyhow possible to split the attribute with a supervised filter through different algorithms like Entropy and Gain ratio or using Weka classifiers for the attribute selection. Sometimes, MOA algorithm is used in the iOVDFT such as Tree Clustering, Randomized RBF, or KM Stream partitioning. However, the choice of an algorithm should be experimented with and must consider the complexity of the case. This transformation was also utilized in the DBSCAN, in a density-based streaming of the time-series. The chosen dataset for this case study has been set to measure the indoor environmental parameters based on the network of sensors positioned at the Intel Berkeley Research lab (Kashif et al., 2021; Khan, 2021; Lee & Ahmed, 2021; Lee et al., 2022a, 2022b). Several sensors are measuring the temperature, humidity, and light in the indoor environment and broadcast their data to the Raspberry pi Board for recording and processing. The sensors were covered the public area of the Lab and according to the following figure, Server Rack and Lab area, as well as rooms, were excluded from the measurements. The data communication is performed by the LAN network. The recorded temperature by each sensor has been analyzed by

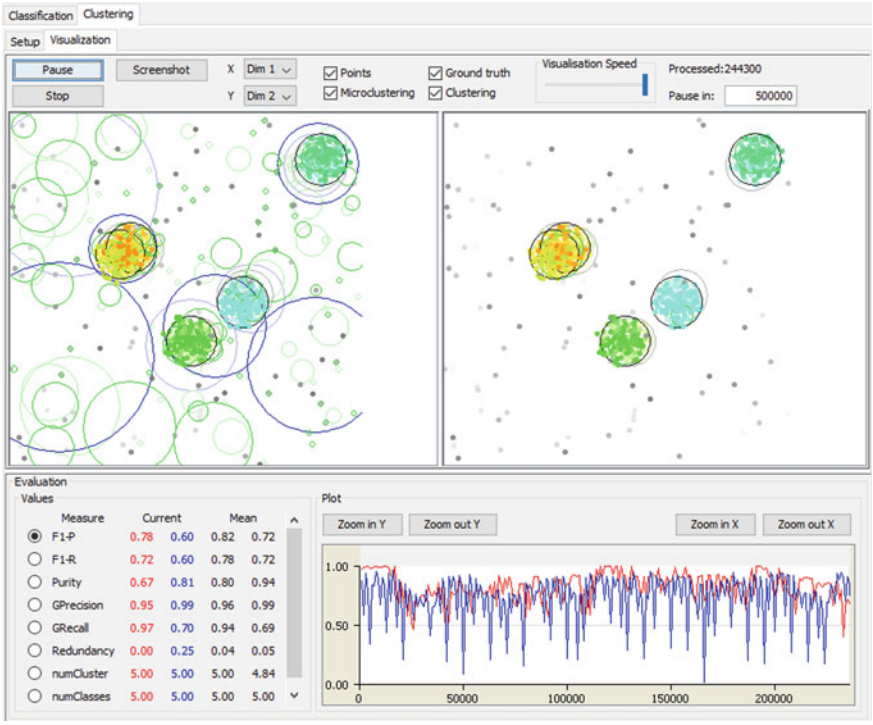


Fig. 3 RBF cluster generator visualization on MOA with 5 distinct colorful partitions

testing a set of 54 time-series each one made by 65,000 observations. In this dataset, epoch number was a sequence increasing monotones of each sensor i.e., readings from a similar number of epochs were read at the same time from different sensors. There is some missing value in both epochs regarding power blackout and missing mote (Sensors) dataset because of certain sensor malfunctions or dead battery. The measurements in the case study are in the unit of degrees Celsius for the temperature, the humidity was corrected in relation to the temperature, and light was measured in Lux. Voltage in volts, between 2 and 3 supplying by a lithium-ion battery and the changes of battery voltage is strongly correlated with temperature. One important achievement in the iOVFDT method is the consideration of the temporal aspects during the pattern recognition and in the prediction of similarity between time-series the ordering of the events was not neglected. Some time series could contain rich information such as hidden patterns that seemed to be treated in an unordered manner and were outranked. The same author has compared the CPU runtime of important data mining methods namely in another article.

From the above results (Fig. 4) it is clear for sake of disposition of distortion and latency there is a need to perform stream mining in a two-step data stream mining algorithm. The cached-based meta-classifier stands for the sliding window are updated in the process of knowledge discovery, and the second (main) classifier

is to verify whether the data is nominated for the knowledge discovery. The sliding timeframe should be adjusted in a way that covers the rate of data change for the prediction of the best sensor. Incremental learning, like IBK, is the better choice for the meta-classifier compared to the ones that need to search the full database—it is not efficient and the models cannot predict but with sufficient power, proper clustering can be achieved. They have also concluded how one HT (Hoeffding Tree) can be improved with the noise and misclassified recall along their CPU Time. The main limitation of this work is the restriction of the data stream in one single data stream in full processing. This means that if the even and odd measurements should be treated in different ways, the method should be adopted from the multiple data stream to discover the subsequences in the sequences of the multiple time series in single/parallel for the cashed-based classification. In a signaling study approach, acceleration and energy of the particles are given parameters of the partial differential equation model, thus, the system time and discrete frequency cycle are important. From the continuous segmentation like windowing, segmentation and discretizing representation like self-organizing map, signal shape language and transformation types like Laplace and Kalman filter or Fast Fourier Transform would be implemented which are out of the scope of Data Mining (Mehmood, 2021; Mehmood et al., 2019; Miller, 2021; Mondol, 2021; Obaid, 2021).

In research, published in relation to RGCE (Realistic Global Cyber Environment), a network traffic dataset was selected for the simulation of real-time DDoS attacks. RGCE is a project-based in Finland for simulation of the closed Internet environment provided by the RGCE project. One of the RGCE services is to provide real IP addresses and geolocations. While the virtual server operating on normal traffic with

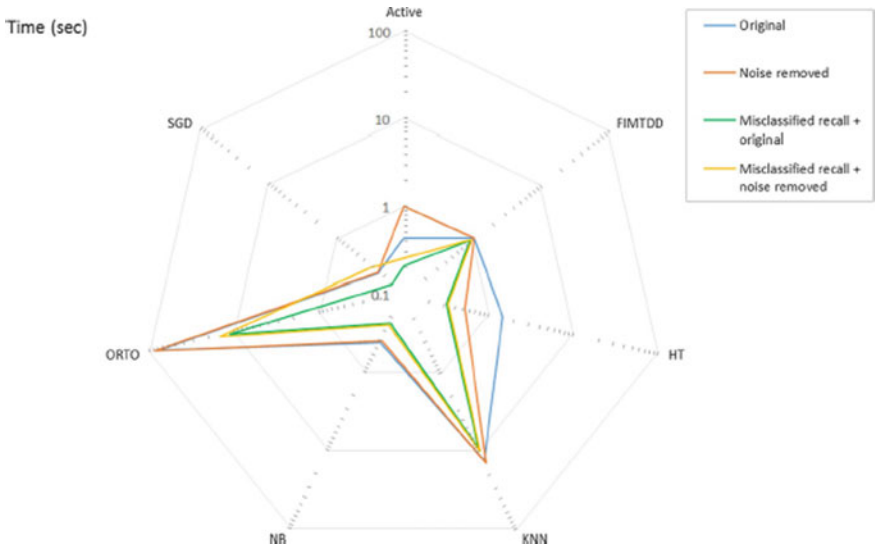


Fig. 4 Runtime measurement in different data stream mining

included text and gif format pictures on the homepage, the legitimate service is performed via HTTPS protocol (SSL/TLS) as a part of the program infrastructure. Here within, the raw network data were extracted in the Libpcap format (This format is a combination of captured Network Data). The captured dataset contains mainly HTTPS network traffic while test hosting communicated with the end-users only via an encrypted protocol.

In this configuration, unencrypted network traffic (HTTP) in the dataset is the first try for the clients (bots) and hosting server before a secure channel was created. Figure 5 represents the important region RNA of the RGCE service provided for the DDoS attacks which were extracted from the project in Feature Vectors captured in Libpcap format can have different scales. Therefore, all of the attributes namely size of packets, size of TCP, time interval since the last previous attack, and percentages of different TCP flags were standardized to the range between 0 and 1 according to a linear alteration on the Max–Min normalization principle. At least two parameters namely the clustering neighborhood size ε and the minimum number of records a cluster needed should be specified in the DBSCAN. The results showed that false-positive rates are quite low, especially with the PCA reduced feature. Network anomalies are the aggregate of remaining clusterless after the finishing of the simulation. An application of DBSCAN is shown in Fig. 6, where Nmin is equal to 3 and clustering neighborhood size of 0.25 (radius of each circle). As been discussed modeling of un-attacking behavior was performed with the help of density-based clustering by noise algorithms for discovering the outliers (DBSCAN). DBSCAN is considered a strong density-based clustering algorithm for detecting outliers and finding clusters in the dataset (Radwan & Farouk, 2021; Shamout et al., 2022).

Data Stream Mining algorithms, such as DBSCAN, have a powerful structure to explain the normal or attacked. The usage of clustering can help in the data mining efficiency, decreasing the number of false-positive rates. The performance of the clustering was also enhanced on reduced attributes, and the data were grouped based on their ordinal/numerical value. The most important achievement in this paper is the power of the classification in the finding of anomalies. Figure 7 shows features obtained for windows timeframe for the considered time point. It represents the normal traffic with a blue line, while a red line corresponds to the DDoS attack. Statistically, Chi-Square computed values calculated for anyone-second timeframe during inside and outside of the attack period.

As one can see, chi-square values corresponding to time intervals when the attack occurs are higher. The method mentioned in the previous section was used to find time intervals that contain anomalous traffic. On the other hand, the application of statistical measurements can successfully capture the attacker's behavior according to the attacking pattern. In this method, the exact time for the beginning and end can help us to locate and hold the attack activity on a real-time basis. In Fig. 8 the Chi-square of clustering is indicated.

Anyhow the results of experiments from ML models (KNN, K-Means, SVDD, and DBSCAN) confirmed that depending on the algorithm the false-positive rates can be varied slightly to be between 1 to 6% (false positive rate) (Afifi et al., 2020; Ali et al., 2021; Alzoubi et al., 2021a, 2021b). The main distraction of the mentioned

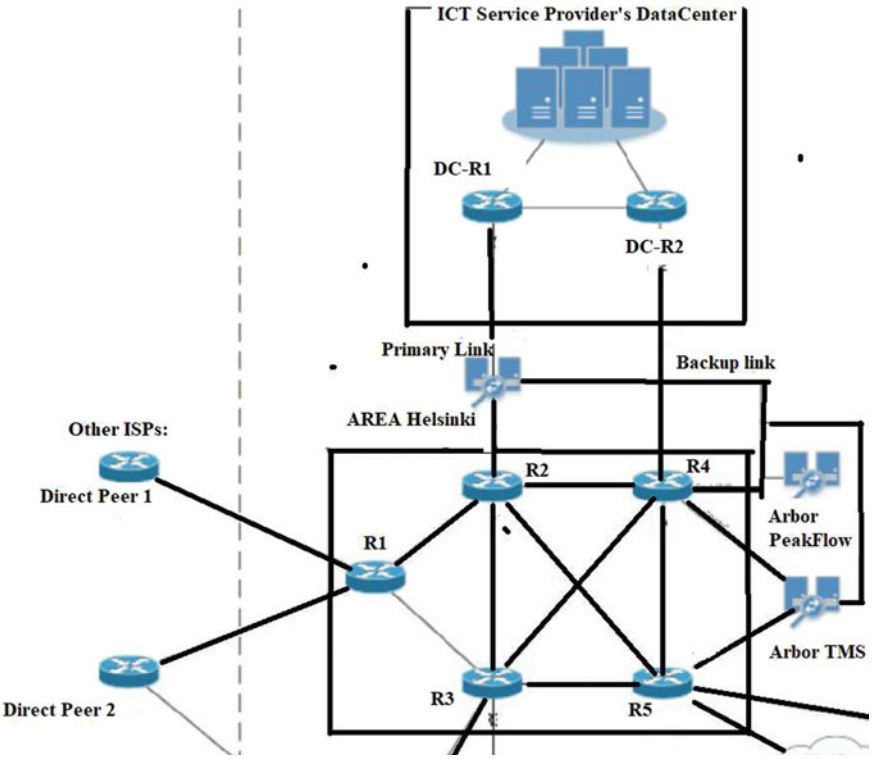


Fig. 5 RNA map (arbor networks peakflow)

methodology was that the target class was considered normal or attacked. In a real test case, there can be a range of different attacks happening at the same time; DOS, Probing (Port scanning), U2R (Buffer Overflow), and R2L (Password Guessing) could be mentioned. A multi-binomial model can be used to predict network intrusion. Additionally, nominal and numerical attributes must be identified as well as both the accuracy and precision have been checked. It was clear that density-based algorithm outperforms other approaches with regard to accuracy and false alarms. The false alarm can be explained low probably for model building. The results of different ML are presented in Table 3.

In the literature there are many DDoS attacks discussed the Ransomware and attacks in form of DDoS, for instance in a study dataset gained on Bitcoins total transactions from 2009 to 2018 were selected to perform clustering heuristics on data temporal analysis and graph mapping. The analysis revealed a significant repeated pattern between families of Ransomware by the techniques such as COSINE, TDA (Topological Data Analysis), and DBSCAN. The reliability of the analysis was confirmed for very little or too many Bitcoins addresses in the relevant clusters and

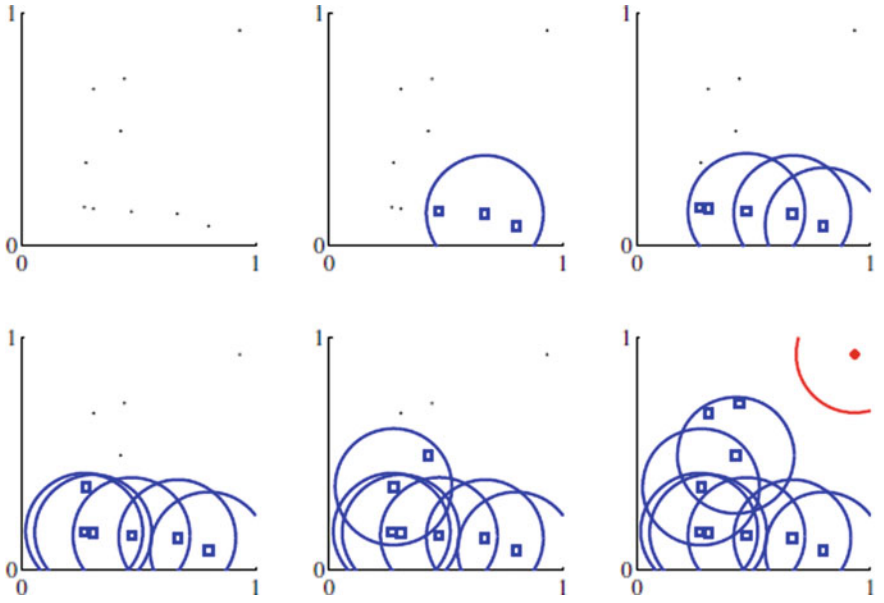


Fig. 6 Implementation of DBSCAN for network normal behavior

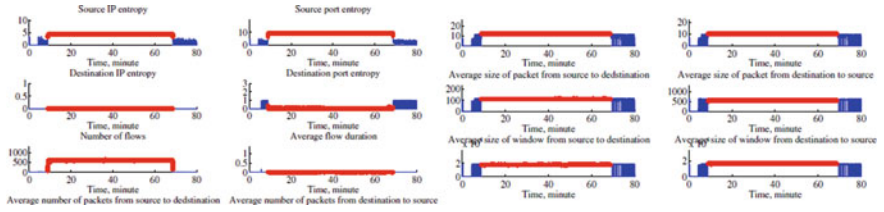


Fig. 7 Convolution between important attributes (timeseries)

their validity by statistical confidence level and compared with recent different scientific papers and studies. Figure 9 shows an example graph of 10 addresses (accounts) in a bitcoin chain block with 7 transactions.

This article aimed to use the Dataset on the Bitcoin transaction by seven different constitutes as a case. Although applied filtering, the high level of penetration, and the big sample size stand as a generalized and wide strict rule for the Internet of Things, we insist on concluding the results through more realistic initiatives and incentives for the better Internet of Things on the thematic too. The attribute of the selected dataset using 24 h transactions from 2009 to 2018 of the bitcoins testing through different features selection by mappers cluster. The dataset was filtered out by some heuristics and the selection was based on two parameters namely inclusion and threshold parameters. Other than the two mentioned above parameters we

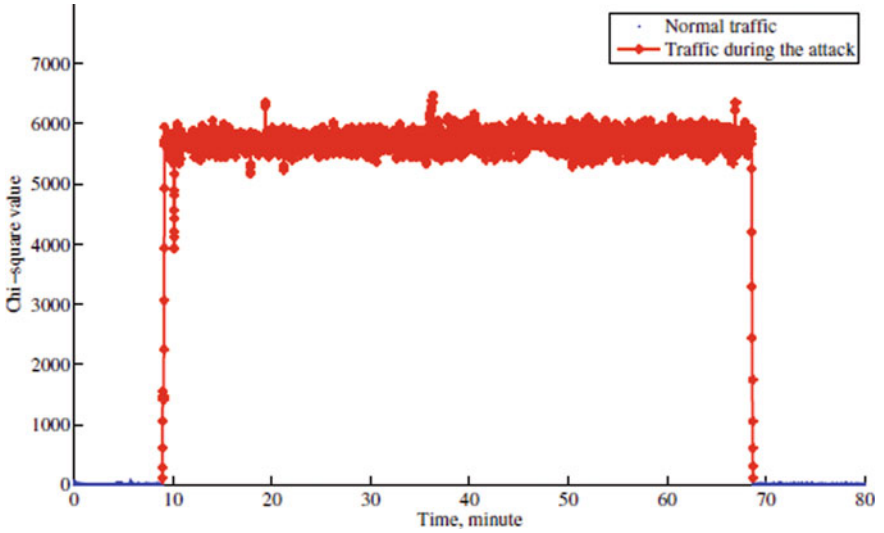


Fig. 8 Network Chi-square in regard to DBSCAN, (red line anomaly condition)

Table 3 Comparison of the results by different ML

Algorithm	TPR	FPR	Accuracy
K-means	100	0.488	99.9951
KNN	100	0.209	99.9979
SVDD	100	6.063	99.939
SOM	100	0.488	99.9951
DBSCAN	100	0.07	99.9993

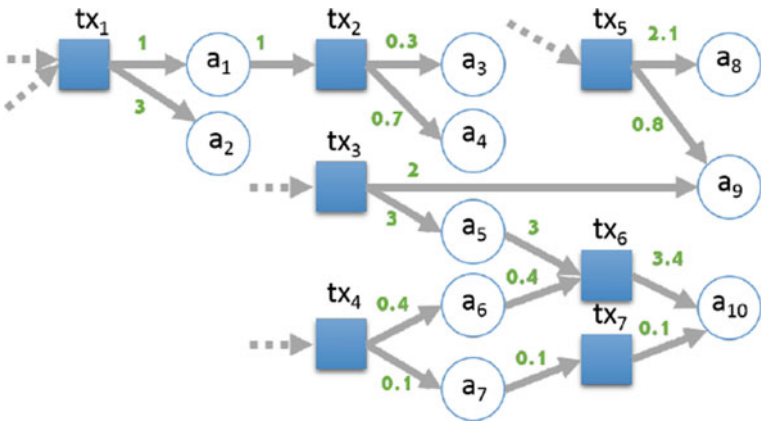


Fig. 9 BitCoin network (edge number is the number of Coins)

have seen that quantiles thresholds on the addresses were performed to avoid false-positive predictions of malice when there is no evidence of past significant events. Preprocessing of the data is therefore a very important step when working with the dataset more sensitive to the imbalance—temporal with attention on the metrics and hyperparameters (Al Batayneh et al., 2021; Ghazal, 2021; Ghazal et al., 2021).

As it has been demonstrated for the capturing of each snapshot of the network the following features for each address are considered. It should be noted that in regard to the temporal behavior of the different clustering windows were implemented in the dataset to distinguish between different geolocations. The result of this section was for this specific importance of specific attributes such as weight and count which are designed to quantify the merging property of the network or loop which is measured the splitting and switching of the network path, and also merging all to 1—N pattern where the currencies can be sold or converted to flat currencies.

After running the data over several other options in 2-dim neighborhood, the required output has been validated on two variables t-significances in relation to perplexity or an effective number of neighbors, which answers the question of how big a network normally is, and how important it is subjectively concerning which family (Fig. 10). Distances and sizes of the cluster are not conveying any concept, but the group of addresses means that DMALocker and Crypxxx are locating in the center while CryptoLocker and CryptoWall are often together in many groups. The most common application is the cluster purity for every Ransom with all addresses from the same family. The Cerber, CryptoWall, and CryptoLocker, have gained around 40 percent of purity where the most improved number of clusters were in the amount of k = 12,500 (Fig. 11).

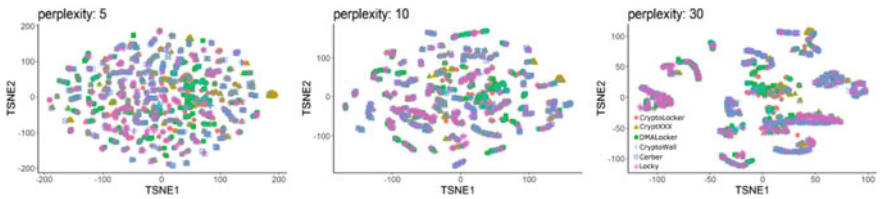
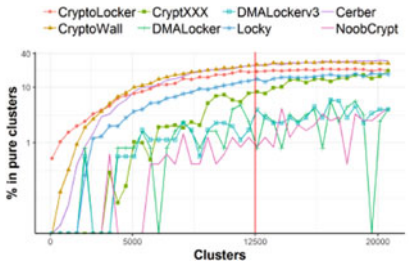


Fig. 10 T-significance clustering in relation with perplexity



	Crypto Wall	Crypto Locker	Cerber	Locky	Crypt XXX	Noob Crypt	DMA Locker
CryptoWall	3145	5122	1737	3015	624	702	321
CryptoLocker	4826	1766	2380	1843	618	238	179
Cerber	3415	2285	1885	9763	1696	22	37
Locky	4077	3023	1512	832	460	405	384
CryptXXX	1024	1077	1467	355	155	52	5
NoobCrypt	344	164	18	95	25	12	37
DMALocker	140	107	21	61	6	33	4

Fig. 11 Percent of purity and no. of shared clusters of the ransom families

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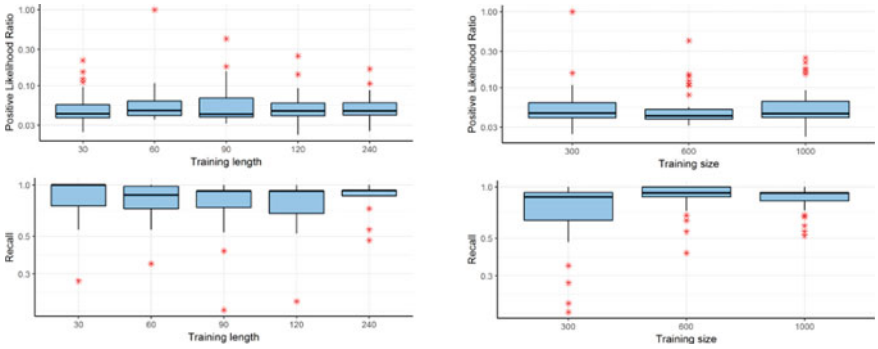

Fig. 12 Effect of training size and length on the positive likelihood ratio and recall

The co-clustering families were shown in the last tables were also supported for CryptXXX, from the Symantec warns security company that on 2016 as Trojan Trojan.CryptoLocker.AN, therefore it can advantageous to search for similar patterns of the Ransom families. There is a daily more than 500 K transaction on the Bitcoin alone and the number of false-positive rates can happen to the dataset. One of the most important achievements in this report is the class rebalancing to different Ransomware addresses. On the other hand, regarding the temporal characteristics of the dataset, the concept of sliding windows was introduced to the 30, 60, 90, 120, and 240 for the training of the model (Fig. 12). The effect of training size is indicated in the following graph. Finally, Accuracy and Recall were both along with the maximum likelihood function were improved by this setup (Ghazal et al., 2013, 2021; Ghazal et al., 2021;).

3 Research Method

In this research, we have firstly conducted a network anomaly detection experiment from KDDCUP 99, LAN activity log of a military environment. We aimed to predict the probabilities of malicious activities (intrusions). The class attribute of the model was binary with 38 attributes of numerical type and 3 attributes were of the nominal character. The attributes are categorized into four categories including inbound and outbound connection features which were basically:

- footprints of each network from source to host and vice versa (e.g. protocol, service type, duration, status of service, and data bitrate).
- Content Access Level Features such as the number of times a user access system directory entrance, administer passwords trials, access control, and user privileges,
- Network connection Time-dependent Features indicating the number of connections to the host in the last 2 s considering the error flag on the same port number.

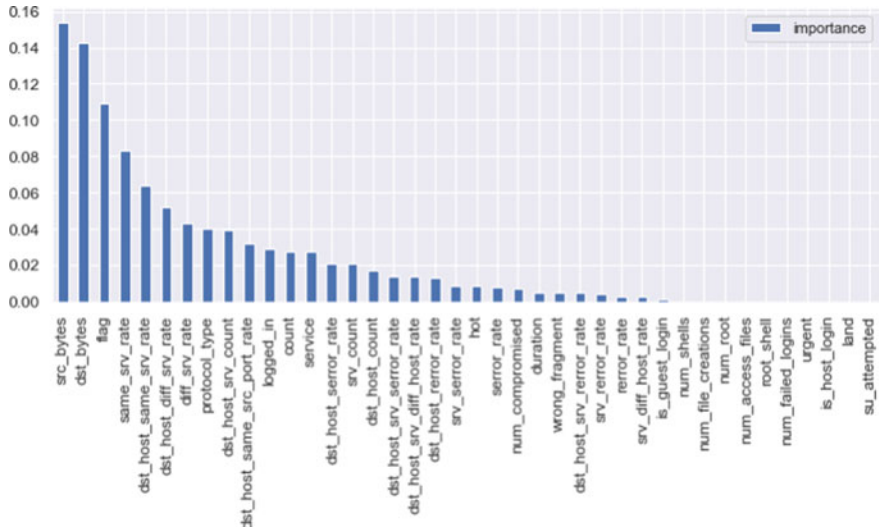

Fig. 13 Feature selection

- Destination Traffic Features, which are a representation of a connection to the same destination IP address of the host while activating the error flag. The feature selection method was performed by Random Forest in Fig. 13.

This experiment was firstly performed with the 4NN batch processing. Later on, by the evaluation of the model when the cost–benefit analysis would be considered the accuracy was 98.8% FP average rate and 1.4% of FN rate with the above 4NN. For avoiding the overfitting error, attributes were filtered on the hybridized subset selection and wrapper techniques models by using model information gain and SVM model. Both were purposely used to improve the model accuracy.

This prediction power resulted in approximately 1000 false positive alarms in network 50 K instances, where 6, 9, and 23 numbers of nominal and numerical attributes were selected. The following table shows the efficiency results of the SVM model. Table 4 shows the efficiency results of the SVM model.

Results of our experiments from batched ML models (SMO, KNN, ANN, and Logistic regression) confirmed that depending on the batch size, and other hyper parametrical, the F-Score model can be varied to be between 94 to 98% (with 2 to

Table 4 Batch processing results on the KDDCUP 99 network anomaly detection with 6 attributes

TP rate	FP rate	Precision	Recall	F-Measure	MCC	ROC area	PRC area	
0.954	0.135	0.89	0.954	0.921	0.825	0.909	0.873	Normal
0.865	0.046	0.942	0.865	0.902	0.825	0.909	0.878	Anomaly
0.912	0.094	0.914	0.912	0.912	0.825	0.909	0.8	Avg

Table 5 Batch processing results on the KDDCUP 99 network anomaly detection with 23 attributes

TP rate	FP rate	Precision	Recall	F-Measure	MCC	ROC area	PRC area	
0.981	0.11	0.911	0.981	0.945	0.879	0.969	0.956	Normal
0.89	0.019	0.977	0.89	0.931	0.879	0.969	0.975	Anomaly
0.939	0.067	0.941	0.939	0.938	0.879	0.969	0.965	Avg

Table 6 Batch processing results on the KDDCUP 99 network anomaly detection with 9 attributes

TP rate	FP rate	Precision	Recall	F-Measure	MCC	ROC area	PRC area	
0.984	0.111	0.911	0.984	0.946	0.882	0.975	0.971	Normal
0.889	0.016	0.98	0.889	0.932	0.882	0.975	0.976	Anomaly
0.94	0.067	0.943	0.94	0.94	0.882	0.975	0.973	Avg

4% false rate). Interestingly, in case 4NN algorithm with a batch size of 50 outperformed Bootstrapped LogitBoost, logistic regression, and Bayes Naïve. One of the achievements was the runtime performance of 0.25 s on Logitboost on KDDCUP 99 dataset with a high number of classes that are not distributed independently. Repeating the same setup for filtered SVM, TP and FP rates were promoted around 4 percent, but the runtimes were 58.93 and 13.98 s with 23 and 9 attributes respectively. These results are shown in the following tables (Tables 5 and 6)

This proved that each packet of data cannot implicitly explain the state of containing packet. This fact was also reported in the literature on the network anomaly detection on KDDCUP 99 dataset where temporal dependence is present. Nevertheless, the 97% True Positive rate accompanied by 1.5% False negative motivated us to switch to other datasets for the designing of the data streaming experiment on the Mirai DDoS network activity, a type of Ensemble detection strategy based on two learners. The stability learner stands for the ground truth on the past information and an evaluator that updates, replaces, or removes instances according to the most recent data streams forms a plasticity region around the classification problem. In an era of anomaly detection, Ensemble approaches were chosen for the concept drift in this study, which was DDM, EDDM, and Hinckley page (Kalra et al., 2020; Khan et al., 2021a, 2021b). The data was further classified and evaluated by Adoptive Hoeffding Tree, Leveraging Bagging, no-change, and/or majority classifiers with prequential Interleaved Test and Train samples. Regarding the temporal dependence of KDDCUP 99, usage of no-change and/or majority classifiers was proposed in the literature but in this experiment, the Kappa Statistics based on Random classifier by prequential cannot be misleading, measurements are compared based on the Classification analysis on Damped Statistic while computational costs and proposed Concept Drift Strategy resulted in relatively higher accuracy and recall. For sake of availability in real-time, the CRUD operations were performed on MongoDB DBS. The objective of this experiment is to work with a temporal type of attributes by application of stream data mining with fewer false-positive rates. We aim to make

comparable results as we believe that fewer false-positive rates with lower precision will be achieved in comparison with the Mirai dataset.

3.1 Dataset Description

The selected database is IoT devices' Mirai attack which is the Network Mirror data of 10 min of activity in a simulated controlled environment connected to an access point which is designed to have a victim and an attacker device. More than 700 k data packets are recognized and captured by having a binomial value for the class attribute of the model (value 0 when there is no attack and value 1 for a network attack) (Lee et al., 2021; Matloob et al., 2021; Naqvi et al., 2021). When a fraud packet is received the behavioral attributes can be extracted. Two types of data are contained in this packet which are statistics or bandwidth behavior of a small window. These temporal analyses could be on the general information of the packet senders and also on the traffic between the sender and receivers. The first type is defined as Source MAC and IP address (SrcMAC-IP). The second type is the traffic between source and destination (either IPs or TCP/UDP Sockets). The structure of the dataset embedded in MongoDB can represent that there are 20 classes of nominal on the features as well as numerical attributes (see Fig. 14).

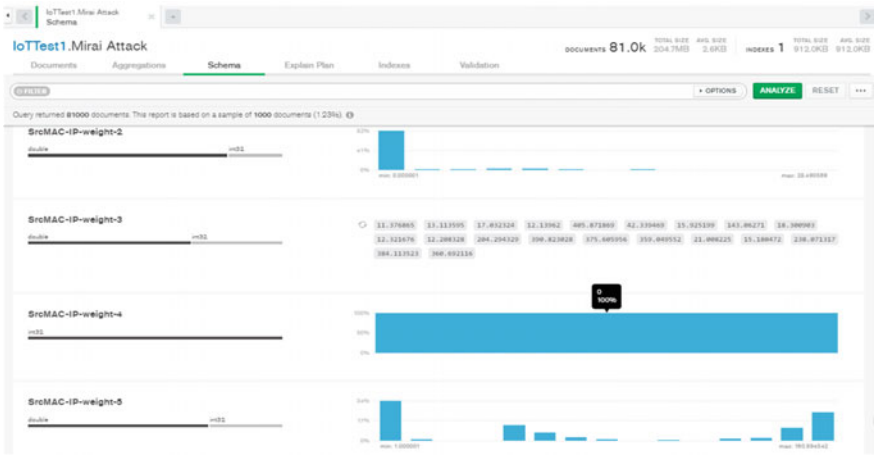

Fig. 14 Big data system implementation on MongoDB

3.2 Feature Extraction

The attributes harmonized through damped statistics such as packet id number, Linear Sum and Squared Sum can be further extended to explain the signaling behavior of the packets in regard to their context and traffic. Every packet was implemented in the feature extractor to create 23 features for the description of outbound bandwidth (8 features), inbound and outbound bandwidth (8 features), packet rate (4 features), and inter-packet delays of the outbound bandwidth (3 features). The packet size of outbound bandwidth statistic measures was divided to mean and standard deviations aggregated by SrcMAC-IP, SrcIP, Channel, and Socket. The packet size of inbound and outbound bandwidth statistic measures was divided into Magnitude, Radius, Approximate Covariance, and Correlation Coefficient aggregated by Channel and Socket. Packet count by the weight of SrcMAC-IP, SrcIP, Channel, and Socket, and packet's jitter by the weight, mean, and standard deviation of the Channel. For the consideration of timestamp, these values are extracted by the same feature with five windows of length 100, 500, 1500, 10,000, and 60,000 ms, which sums the total attributes into 115 plus one class attribute on the basis of their weight and decay factors while they are extracted. For the network administration, the IP address is like the postal code, and each channel is a mailbox. On the other phrase, residents (services) need to access their messages through their mailbox. The number of a channel cannot solely identify the path in which the packet would be sent while the UDP/TCP isn't defined. Mirai bot through ports number 23 and 2323 uses TCP/IP to map packets to services. These ports are belonged to Telnet service enter the command and control by legitimate access. The botnet can firstly disable the Telnet and search the ports by sending SYN, ACK, RST, etc. flags on large scales. One of the millions of inbound traffic could be accompanied by more than 1 GB ack flag and is known as TCP stomp flood. These bots are not anyway easy to handle but using CNC control on TCP/23 and looking for the NetFlow on this channel is also a good idea. The chart below (Fig. 15) is one out of 115 attribute representations of Channel chart 100-ms versus 1-min windows in the past as it has been aggregated by Channel of 10-s windows in the past.

3.3 Evaluations Sets

Contrary to the batched Learning which is leveraged by the random arrangement of train and test sets, in data stream Mining the challenge of streaming posed another type of evaluation. Among the recently developed approaches for the evaluation of data streams, the hold-out trainset in stream mining is used when cross-validation computational costs are big enough that make splitting of the data into train and test efficient. The problem in our case was that network vectors were based on damped statistics and chronologically on the basis of decay function and cannot separately be handled for the evaluation and validation of classification while it is

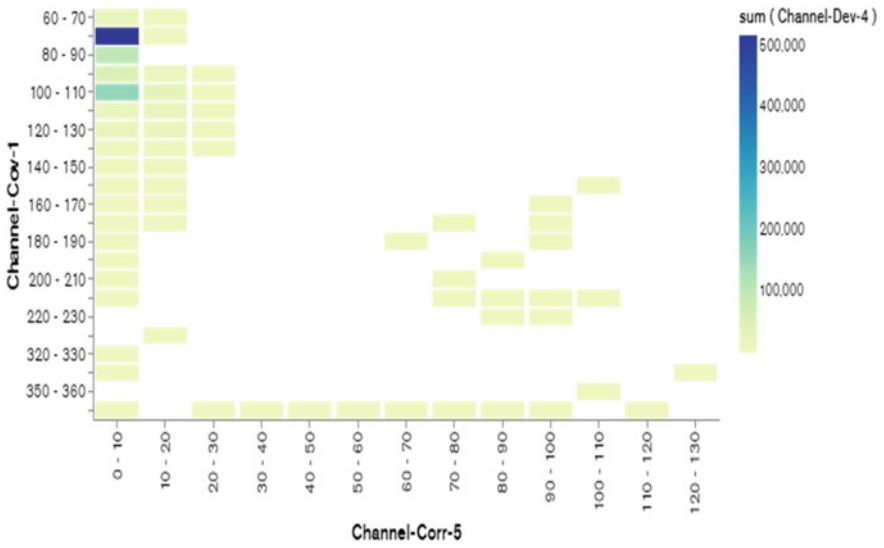

Fig. 15 Channel covariance versus channel correlation extracted from DBMango atlas

impossible to distinguish that last records are from 1 min or 10 min ago. In our case, a prequential test-then-train evaluation was performed by Hoeffding Adaptive Tree and Leveraging Bag separately. The evaluation process has taken 124.94 and 304.61 s respectively to complete the testing of every single point and train the model while the majority class which process runtime on the data without evaluation was 85.38 s. For both evaluations' frequency has been considered 10,000 packets which are around 2 percent of the whole 764,137 packets. In leveraging Bag, five Ensembles like bootstrap, Blast, and Stacking were chosen for the augmentation of drifting with 3 leaves and 6 nodes from a single leaf root at the beginning of the Mirai Bot activation. In Hoeffding Adaptive Tree, for the calculation of Information Gain at the given confidence level, the tree grown from root to 4 leaves and 7 nodes, and the leaf was again split to reciprocate the algorithm (Rehman et al., 2021; Suleman et al., 2021).

4 Classification Results: Ensemble Learning

The concept drift can detect changes according to the damped statistic, in Fig. 16 two streaming behaviors of the dataset and their detected anomaly are distinguished. It is clear that at the beginning of the stream dataset the number of false alarms is increased by the application of EDDM and Page Hinckley—the input values and detected changes are identified.

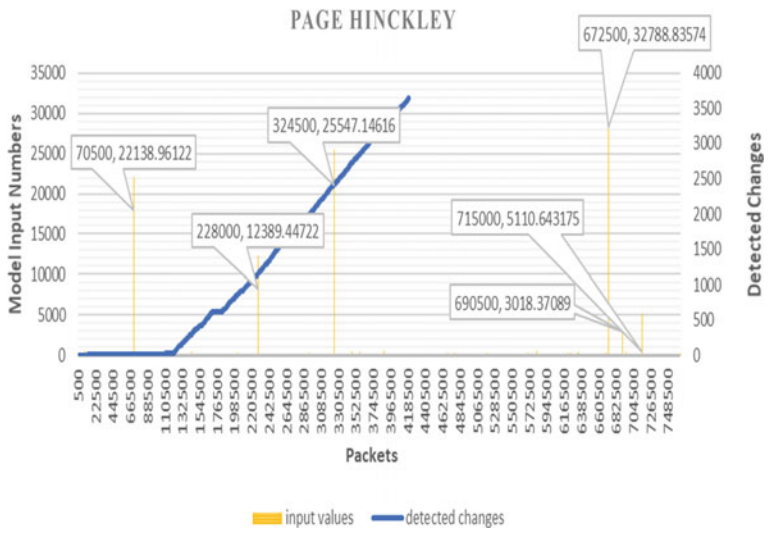

Fig. 16 Concept drift strategy for anomaly detection by EDDM performed on MOA

As it can be seen in Fig. 16, the data class attribute of normal type is less than attacked type and started on the 121 K records and is not happening. In Fig. 17, the accuracy of two tree classification is shown which can be compared with the majority class and can be best explained by temporal dependence of the Dataset.

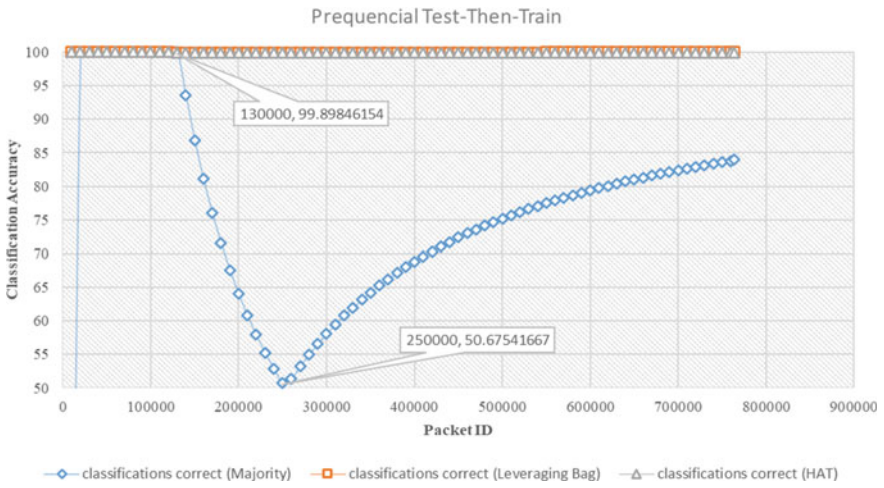

Fig. 17 Classification accuracy on majority class, leveraging bag and hoeffding adaptive tree

5 Conclusions

One of the challenges in Network Intrusion Detection is the stochastic behavior of the fraud activity which makes the Data Stream Mining suitable to use its ability of adoption to the drift. In this work, we have designed an experiment to show that even stream data mining datasets can be misleading and trapped the case in accuracy pitfalls. In tradition, batch Machine Learning the train and test dataset comes from the same distribution which has been now experimented for the inadequacy of false alarm rate in the KDDCUP99 dataset. In this work, our chosen IoT Mirai attack network mirror was implemented in Page Hinckley change Detection with the 115 attributes of different window sizes of 100, 500, 1000, 10,000, and 60,000 packets in a single drift strategy to predict the changes. We have also concluded that detectors worked well on the timespan in which fraud events occurred and allowed to contribute a diverse range of decay factors in the calculation.

The attributes were chosen in the evaluation by two groups of Tree consist of five Ensemble to test and train every packet. The proposed method was very adaptive and fast in comparison to the Batch Machine Learning, while it could advantageously get the frequency variation in comparison to the No-Change ADWIN which could process the more recent past.

6 Future Work

The chosen dataset in this work was a virtual IoT framework from a telnet protocol device including a bot to have legitimate access to the command and control. Big Data System provides a progressive framework, which is adoptive and can be synchronized with queries that create Dataset in different topologies. This can be advantageously providing an on-the-fly scheme in an online integrative network Lab with higher defense strategies in an era such as Smart Cities and a real-life problem like health and financial sectors.

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Machine Learning-Based Intrusion Detection Approaches for Secured Internet of Things

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Abstract Nowadays, protecting communication and information for Internet of Things (IOT) has emerged as a critical challenge. Existing systems use firewalls to ensure that they are safe from any unexpected occurrences that may disrupt the desired systems and applications. Intrusion detection systems (IDSs) are an acceptable second line of defence for IOT applications. IDS play a crucial role ensuring that

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_110

it enhances the IOT security level maintaining sophisticated framework. Attackers have continuously been attempting to determine novel ways to circumnavigate security frameworks that prevent the structures. This paper reviews the security advances, threats and countermeasures for the IOT applications. A state of art review has accomplished using the references from 2009 to 2020 to encompass the real demography of the IOT security research data. This work also highlights the deep learning-based intrusion detection approaches for Internet of Things (IOT) security. With the systematic literature review approach, the review suggests that implementing existing security measures, such as encryption, authentication, access control, network and application security for IoT systems and their intrinsic amenability is ineffective for the IOT systems.

Keywords Machine learning · Internet of Things security · Intrusion detection

1 Introduction

The extent of the use of the Internet of Things (IOT) has made it imperative to have several devices on a network. As such, most of these are computers, but there are sensors, digital tools, and vehicles (Ghazal et al., 2021a, 2021b, 2021c, 2021d, 2021e; Lee et al., 2022a, 2022b). The large size of the network of devices and anonymous or uncontrolled structure of the Internet is imperative to consider (Al Kurdi et al., 2021; Alshurideh et al., 2019, 2021). Protecting data and communication systems is imperative in IoT security. A plethora of frameworks used in firewalls in IoT are useful in protecting each of these systems. Intrusion Detection Systems (IDS) are useful in IoT security and ensure that these frameworks are safe all the time. In this regard, attackers have continuously been attempting to determine novel ways to bypass the systems that prevent the structures (Akhtar et al., 2021; Al Ali, 2021; AlHamad et al., 2022; Alhamad et al., 2021). The IOT system requires ensuring that they have kept malware out of their operations. It is of the essence to achieve this objective because it means that they focus on ensuring that they have kept their devices and systems safe. Spark-Chi-Support-Vector-Machine is an example of an IDS algorithm (Ali et al., 2022; Alnazer et al., 2017; Alnuaimi et al., 2021; Alsharari, 2021; Alshurideh et al., 2022a, 2022b). The model reduces training time, increases performance, and is ideal for big data. It undergoes loading a dataset and exporting it in the resilient distributed datasets and data frame that deploys apache spark.

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The data then undergoes pre-processing before the selection of features, training, testing, and evaluating in another dataset. It is an incremental task to ensure that intrusion detection systems are of the highest capabilities from the perspective of IOT security. However, it does not imply that companies should avoid trying to understand the implications of failing to detect intrusions into the systems that they have set. If the algorithms that they are deploying at a specific time have been outdated, it becomes easy for an attacker to take advantage of the system by attacking it at any given time. As a matter of consequence, the use of machine learning techniques in intrusion detection systems should help IoT companies avoid unwanted issues that may occur over time (Alshurideh et al., 2020a, 2020b; Akour et al., 2021; Nuseir et al., 2021; Salloum et al., 2020) Consequently, the essence of this paper is to outline the usefulness of machine learning in intrusion detection systems. As such, it will focus on deep learning and how best it is useful in the context of intrusion detection systems for IOT systems to protect systems and valuable information (Alshurideh et al., 2020a, 2020b; Ali Alzoubi, 2021a, 2021b; Alzoubi et al., 2020a, 2020b, 2022).

Big data analytics has become imperative in the analysis of data generated from IoT. Connected devices help in the process of data generation, and the analysis is imperative in improving the decision-making process. The role of big data in IoT is to ensure that the data has undergone processing in real-time. The data then undergoes storage using a variety of technologies available in the current world. IoT has become a backbone of the big data trend with output information becoming the data or input for another system. The data is further useful in guiding specific processes. IDS in IoT can be useful in enforcing its security, as shown in Fig. 1—for example, it is helpful in detecting attacks once a hacker breaks the cryptography (Alzoubi & Ahmed, 2019; Alzoubi & Aziz, 2021; Alzoubi & Yanamandra, 2020; Alzoubi et al., 2020a, 2020b, 2021a).

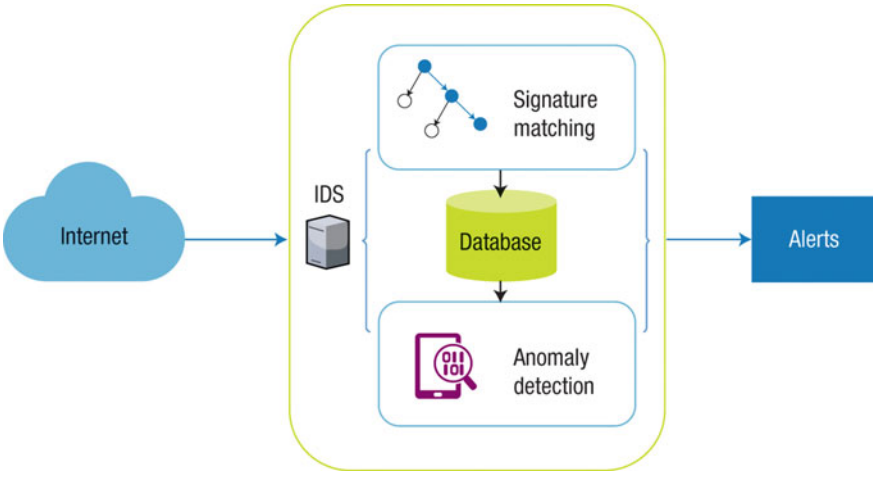

Fig. 1 IDS in IoT (Mohammadi & Namadchian, 2017)

The contribution of this paper is as follows:

1. An in-depth discussion of recent algorithm and techniques used in big data incentives.
2. Taxonomy of deep learning and its usefulness in intrusion detection systems.
3. Discuss the recent IDS threats; advance techniques and figuring out the research directions and its limitations in IOT & block chain applications.

2 Literature Review

Block-Chain-based security solutions for IoT systems help secure peer-to-peer networks. The blocks are composed of transaction records that users initiate. They help prevent unauthorised operations on IoT data by using blocks to register all transactions. The evolution of Intrusion Detection Systems hinges on the fact that there are specific elements that control them. The IOT network systems have increased in complexity to the point that they are prone to mistakes. In turn, these errors are easy to exploit from the context of attackers or intruders. The present IOT network systems have several critical deficiencies in their security networks, which makes it easy for attackers to target them for their gain (Aziz & Aftab, 2021; Cruz, 2021; Eli, 2021; Farouk, 2021; Ghazal et al., 2021a, 2021b, 2021c, 2021d, 2021e). Although there is a need for additional work or tools that attempt to find and fix deficiencies, it is an incremental task to close all existing loopholes. Despite that intrusion detection systems exist, absolute prevention in a specific system is an additional task. As a matter of consequence, intrusion detection systems have emerged as the best way to find and identify any intrusion in a specific system. Afterward, it becomes imperative to have a framework for prevention, which may depend on automation alone.

Most of the IDS systems seek to protect IoT devices, from external attacks, which is critical for the organization. In this concern, the end to the unnecessary aggression experienced from the context of the external world is a crucial aspect of the business because it protects its interests. Several attacks on the IOT security system articulate may be detrimental to the IoT framework. Many of the attacks may occur on the network from authorized users in the company. Many security attacks are hard to identify from the context of the company in focus. New types of attacks have developed in cross-detection and prevention methodologies in various IoT systems. Consequently, security solutions like Check Point focus on the use of additional updates or learning to increase the dynamism of the entire IoT system (Alshurideh, 2022; Guergov & Radwan, 2021; Hamadneh et al., 2021; Hanaysha et al., 2021a, 2021b; Hasan et al., 2022; Joghee et al., 2020).

The IDS should have three primary mechanisms that make them an essential part of the current protective technology. In this contemplation, the first part of the IDS is the data collection framework. The role that it plays in the IDS is to ensure that they track network flows in the technology. Once they articulate this aspect, it becomes critical to transmitting the data in the form of packets. The second part of the IDS is vectorization, where data is used for various features; as a matter of consequence,

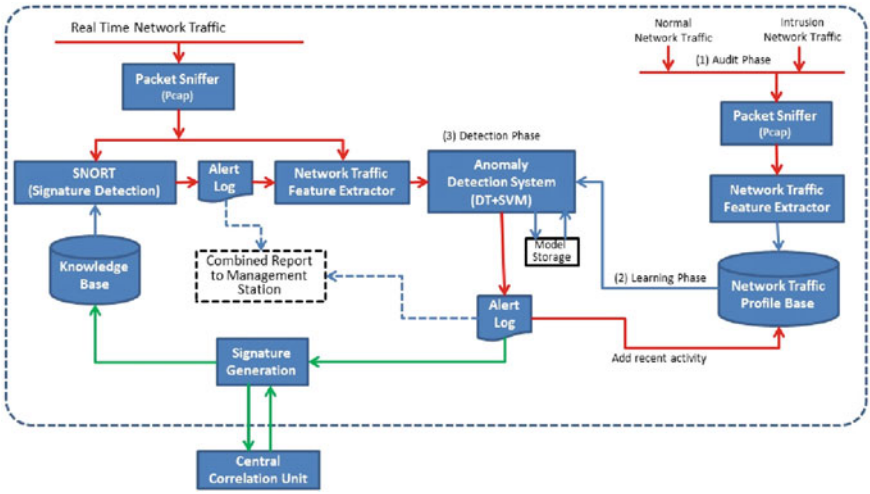

Fig. 2 IDS framework

they create feature vectors. The final aspect of IDS is the classification engine that gives classified packets to state whether the system is standard or there has been an intrusion. The use of vectors in the engine traces the flow of all packets within the system using previous knowledge to identify if there has been an intrusion or if the system is typical, as shown in IDS framework, Fig. 2.

The classification engine is an imperative aspect of the intrusion detection system. From a notable perspective, it decides if the converted features are part of an intrusion in the specific locality or if normalcy is present. the part is signature-based, which has the implications of classifications following anomalies or defined signatures based on the normal flow of packets in the systems (Kashif et al., 2021; Khan, 2021; Lee & Ahmed, 2021; Lee et al., 2022a, 2022b) the first one has excellent reliability and decision time, but it cannot detect new types of attacks; as a matter of consequence, it produces a low detection rate. Simultaneously, the latter has low acceptable scalability, robustness, and flexibility. As a matter of consequence, each of these systems needs to imminent the correct dynamism to ensure that they reach the highest level of performance. Majorly, they need to use the best techniques to ensure that they follow machine-learning mechanisms.

Machine learning-based IDSs for enhancing the IOT security have become critical challenge for the industries. One of the crucial aspects of such systems is the need to have a significant training time for processing a large dataset from the network's previous flow of data. Traditional machine learning approaches include decision trees, logistic regression, and support vector machine (SVM). SVM is an algorithm that finds optimized hyper-planes to classify between two classes. Building an excellent SVM model majorly depends on finding an excellent kernel. Random Forest is built on several decision trees that combine the prediction of a single tree. Xgboost and Naïve Bayes are based on machine learning whereby the former is useful for

heavy computational power resources while the latter is a lightweight solution. With the emergence of technology called deep learning, it has been easy to provide an efficient mechanism for learning. The technique has been a critical aspect of the intrusion detection systems because it has provided a new way to examine machine learning and how technicians and coders can deploy it in various use cases. Deep learning has been a critical aspect of these systems because it is a parallel technology to intrusion detection systems and their machine learning algorithms. It has resulted in the reduction of the training time for these frameworks. Similarly, it has significantly helped raise the accuracy of the proposed system (Mehmood, 2021; Mehmood et al., 2019; Miller, 2021; Mondol, 2021).

Machine learning consists of a broad range of paradigms found in continuous evolution, which presents cross relationships and weakened boundaries. Various applications and views might culminate in differentiated classifications. As a matter of consequence, it is hard to refer to as fully applicable taxonomy accepted in the literature. The taxonomy is oriented to security operations professions. It has the proclivity to avoid any ambitious objectives of presenting the principal classification for all application use cases and artificial technology professionals. Machine learning is divided into shallow learning and deep learning alternatives. Shallow learning has supervised and unsupervised variants. The supervised version uses shallow neural networks, K-nearest neighbour, hidden Markov models, Random Forests, support vector machines, logistic regression, and Naïve Bayes. The unsupervised version has an association and clustering as examples. Deep learning also has supervised and unsupervised variants. Supervised deep learning has recurrent deep neural networks, feedforward, convolutional neural networks, and feedforward, fully connected neural networks. Unsupervised deep learning has deep belief networks and stacked Auto-Encoders. Unsupervised deep learning techniques do not need a representative and large dataset than that which human experts have previously classified. In contrast to that, supervised deep learning variants do not need a pre-labelled training dataset. Shallow neural networks are algorithms based on neural networks and have a pre-set of processing elements called neurons, which are organized into two or more communication layers. They include all neural networks with a limited number of layers and neurons. Despite their existence, they have been most useful as classification tools in cyber security. K-Nearest Neighbour is useful in various classification models and may be imperative in problems that relate to multiple classes. In contrast to that, a significant issue exists in the testing and training phases of the software. From a notable perspective, it is computationally demanding to classify all test samples and compare them against all the training samples used in the previous phase.

The Hidden Markov Model is an imperative model that entails a set of states to produce outputs by deploying a range of probabilities. The objective is to determine the states' sequence produced at observable outputs. The model is a useful way of understanding temporary behaviours and for quantifying the probabilities of specified event sequences. The latter use cases have been the most applicable in the context of cyber security despite that training of the model can occur on datasets with or without labels (Ahmad et al., 2021; Obaid, 2021; Radwan & Farouk, 2021; Shamout et al., 2022; Tariq et al., 2022).

Random Forest is a set of decision trees that contemplates the outputs of all tresses before giving a final response, which is typically unified. All decision trees are conditional classifiers, which mean that they are visited from the top, and at every node. The given conditions are checked against one or more aspects of the data that has been analysed. The methodology is useful for a large dataset and excels at several issues in the multiple class segments. In contrast to that, over fitting is a critical aspect of deeper trees and needs articulation to attain its goal. Support vector machines are classifiers with a non-probabilistic take on data. They are useful mapping samples of datasets in feature spaces with the objective of distance maximization between sample categories. There is no assumption on input features, but the performance is unfitting for multiple class classifications. The limitation in scalability might culminate in long processing time.

Logistic regression is a categorical classifier that has the objective of adopting a discriminative model (Afifi et al., 2020; Ali et al., 2021; Alzoubi et al., 2021b). It is similar to the Naïve Bayes algorithm in that it makes the prior independence assumption of features of inputs. The performance primarily depends on the training data's size (Al Batayneh et al., 2021; Ghazal, 2021; Ghazal et al., 2021a, 2021b, 2021c, 2021d, 2021e). In this consideration, the Naïve Bayes algorithm is a probabilistic classifier that makes prior assumptions that input features of a dataset have independence. In this concern, therefore, these are scalable and do not need a large training dataset to ensure that the results they produce are appreciable. The gap in the literature is a lack of succinct consideration of deep learning methodologies for intrusion detection systems.

3 Methodology

The methodology of choice for this paper was a review of the literature concerning the use of deep learning approach to implementing an intrusion detection system for information systems security. The objective was to find papers that discussed deep learning algorithms used in intrusion detection systems. The researcher was determined to find 56 updated articles from the year 2009 onward. Most of the deep learning algorithms have been present in the contemporary world from this time onwards. As a matter of consequence, it was imperative to include articles in English to ease readability and understanding. As a matter of impact, the researcher excluded articles written in a language rather than English. The database deployed for the research was Google Scholar, since it is a free database, and it offers peer-reviewed articles. These were critical in the study because they made sure of peer-reviewed information being used.

Research ethics is a critical aspect of a study that needs to be considered. The current research did not meet any ethics issues that were worthy of attention. The present paper did not need research ethics to be met at any point. There was no need for respondents to take part in the study because it would have mandated the use of a consent form to which they would agree to participate in the research or reject it

outright based on personal preference. The choice not to use respondents meant that it was relatively easy to conduct the study from the viewpoint of secondary analysis of data. The information obtained from the investigation would be deployed in helping understand the impacts of deep learning in intrusion detection systems.

4 Analysis

Intrusion detection SYSTEMS are a plethora of examples, but the most common are fuzzy logic, rule-based frameworks, support vector machines, artificial neural networks, and statistical intrusion detection systems. Fuzzy logic relies based on human thinking intending to convert information obtained into mathematical equivalents. Persons who have a specialty in one specific area develop rule-based systems. Their role is to examine the traffic in particular systems. Then, they develop attack detention and specific rules that the system should follow. Data mining is a technique used for reaching out for information in a big data setting. The data extraction depends on a set of rules whereby the objective is to ensure that the correlation between users and data has been established (Alshurideh et al., 2022a, 2022b; Ghazal et al., 2013, 2021a, 2021b, 2021c, 2021d, 2021e). It uses the fuzzy set theory to determine the usefulness of fuzzy logic in data. Support Vector Machines are the most preferred methodology for intrusion detection systems. They can select a specific feature vector, and they can distinguish data from two class sets using a particular feature vector for each one of them. They are deployed in several classification systems like sound analysis and face recognition systems. Artificial neural networks are models that give graphs of neurons of data. They have a way to correlate specific vectors with algorithms that help create new data. The method is imperative in examining and learning data behaviours in a system. An enhanced form of artificial neural networks has been preferred in data mining contexts due to increased efficiency. Statistical intrusion detection systems are based on measurements in statistics. In this context, the examination of system or user behaviour is imperative because it helps create a specific statistical model. New intrusions correlate with a particular mathematical model. Some of the methodologies used in intrusion detection systems include Gaussian Mixture Distribution, Chi-square distribution, and Principal Component Analysis (Kalra et al., 2020; Khan et al., 2021a, 2021b).

An intrusion detection system that is based on a signature is useful in detecting attacks that have already been identified. The objective is to reduce the false rates while increasing the detection accuracy, which needs to be considerably high. In contrast to that, performance may suffer when the detection of a new or unknown attack occurs. The system typically has a limitation in the rules used and can be installed beforehand in the intrusion detection system (Lee et al., 2021; Matloob et al., 2021; Naqvi et al., 2021). From another perspective, an intrusion detection system based on an anomaly is best suited for a context, whereby the attack is new or unknown. Although such a type of an intrusion detection system is best suited for such settings and has a high false-positive capability, it has broad acceptance in the

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current research community. Two challenges arise when developing a flexible and effective intrusion detection system to get to understand new issues. The first of these issues is the proper feature selection from the dataset of network traffic to detect the anomaly. The second problem is the lack of availability of a labelled traffic dataset from a real network that should be useful in the development of the intrusion detection system. Deep learning is a technique in the class of machine learning methodologies; it deploys consecutive information layer and processing levels in the hierarchy. The objective is to help in the representation and learning of features as well as the classification of patterns. From a notable perspective, the essence of deep learning is to help the classification results of images to increase. Besides, technology is useful in signal processing, natural language processing, video, images, audio, and speech. It is also helpful in pattern recognition, graphic modelling, and language, which are useful for intrusion detection systems. It means that several deep learning methodologies include Deep Auto Encoder, Auto Encoder, Deep Neural Network, Deep Boltzmann Machine, Restricted Boltzmann Machine, and Deep Belief Network.

Several advancements exist for algorithms used in learning contexts to improve the capabilities within the intrusion detection system that help it reach a low false alarm rate and a high detection rate. From a notable perspective, the deep learning-based approach is useful in overcoming issues that hinder the development of an efficient intrusion detection system. The unbiased comparison of the efficiency of two deep learning algorithms expects that their training be on a similar dataset. Similarly, their testing needs to occur on the same dataset. Although several proposals in the context of cyber security are prevalent in the contemporary world, they rely on a few and old public datasets. While this may appear to be a mistake in the modern manufacture of the intrusion detection systems, the results are hard to compare due to a plethora of issues. First, they may deploy a different split between the dataset used for training and that deployed in the testing phase. Second, one or both of these algorithms might implement a pre-filtering operation that can alter the dataset used in the training phase. Finally, the algorithms used may have differentiated featured. For these reasons, a meaningful comparison between the detection performances of various intrusion detection systems is an incremental task. In this context, the literature may discuss machine-learning methods for two distinct cyber security issues. However, it may fail to consider the training and testing phases for the analysis deployed. As a matter of consequence, some of the solutions obtained may have a higher level of accuracy than others, which is highly problematic. It means that the results might change significantly if the training settings have been differentiated. Additionally, there is a lack of a guarantee that a specific method that works on a given dataset is the best when used in some other datasets. While it may work for one set of data, it might fail to depict the same performance when used on a different one. Security administration professionals have noted this problem, but some remain unaware of its existence. It is imperative to thoroughly query the methods used in the evaluation phase before accepting the performance results from various deep learning algorithms (Rehman et al., 2021; Suleman et al., 2021).

Misclassification in the cyber security context may have an implicit cost that might result in serious problems. A false positive in intrusion detection systems and malware

classification may become the point of annoyance for security operators because it hinders the remediation in the contexts of actual infections. It is critical to get the correct information in all cases to ensure that the intrusion detection system achieves its objective within the shortest time possible. In this context, the phishing detection may cause legitimate and essential messages to fail to reach the specific individuals who need it. In this context, the failure to detect malware may have significant issues in the organization. Notably, phishing emails and network intrusions can be the point of compromise for entire organizations rather than just one aspect of the company in focus. Companies need to be ready to consider the performance of various deep learning algorithms and solutions in the context of organizations. It should be noted that they should then devote them to phishing detection and malware analysis in the context of the systems they have set. It should be noted that they need to perform experiments for intrusion detection systems with the orientation of detecting problems before they can implement them in specific use cases. In this context, the objective is to reduce problems that may make it hard for the organization to exist as a business entity.

Traditional intrusion detection systems have been a point of limitation for a plethora of companies. It should be noted that they are based on static detection rules, which are less than ideal for detecting malware and phishing attacks. There is a need for continuous and frequent updates in a specific system that is imperative for the detection of malware and phasing. For example, companies need daily updates of virus definitions in their antivirus libraries. If they fail to achieve this objective, it is highly likely that they cannot meet the ultimate goal of ensuring that they have the best performance. It should be noted that they could fail to get to know the specific malware they are facing, which may hinder their ability to detect specific instances of malware. When this happens, they compromise the entire system, and an intruder takes advantage of the whole company's security defences.

A similar problem influences advanced deep learning incentives that companies may want to ensure they keep malware out of their existing systems. Some companies may be relying on outdated datasets used for the training phase but think they will achieve the same goals they expect from the framework. It is a critical issue that affects companies because they need to supervise their learning approaches, which should help label training datasets in the best way possible. Creating a manual for similar datasets is expensive for most companies. The implication of cost lies in the fact that the dataset should be considerably large and comprehensive, which should allow the deep learning algorithm to know how to differentiate between various classes. Additionally, the operations are prone to errors and may result in incorrectness in the classification made. Lastly, most companies are unwilling to share data about internal networks because they believe it may give other firms an advantage over their existing data, which could compromise them. The scenario results in an overall scarcity of publicly available data that may be labelled for cyber security operations. The definitive implication is that the periodic retraining of a dataset to ensure organizations use deep learning incentives correctly might be impossible or extremely difficult.

5 Discussion and Open Issues

The IDSs are of various forms, which make them usable in the context of IoT frameworks. The usefulness of these systems depends on the specific use cases, where they are applied. One algorithm may fail to work in a context different from that for which it is designed. Thus, care should be taken to ensure that the correct methodology is deployed in a specific context. The failure to perform an analysis on the issues that may occur may result in unwanted complications. Table 1 is the summary of most related work from the literature along with techniques it also discusses the advantages and disadvantages of the machine learning algorithms.

6 Conclusion

IoT connects computers, but there are sensors, digital tools, and vehicles. IDS are an acceptable second line of defence for a plethora of companies. Big data analytics has become imperative in the analysis of data from IoT. IoT is the backbone of the big data trend with output information becoming the data or input for another system. The paper discusses recent algorithm and techniques used in big data incentives, the taxonomy of deep learning and its usefulness in IDS, and recent IDS threats. Examples of IDS are fuzzy logic, rule-based frameworks, support vector machines, artificial neural networks, and statistical intrusion detection systems. The basis of an IDS is on a signature is useful in detecting attacks that have already been identified. Developing excellent IDS expects understanding proper feature selection from the dataset of network traffic to detect the anomaly and the availability of a labelled traffic dataset from a real network that should be useful in the development of the intrusion detection system. Companies want to use these systems but are unwilling to share their data with competitors. Others fear the cost of installing IDS that will help keep their IoT devices safe. Unless the situation changes, it will be increasingly hard to implement IDS in IoT contexts.

Table 1 Summary of the most related works

Authors and year	Features	Advantages	Disadvantages
Munoz-Gonza´lez et al. (2017)	Convolutional neural network	High error detection rate	No way to be spatially invariant to the input data, cannot encode the orientation or position of the object, circumventing the problems needs adding more data
Tariq et al. (2022)	Convolutional neural network	Accurate, precise	No way to be spatially invariant to the input data, cannot encode the orientation or position of the object, circumventing the problems needs adding more data
Li et al. (2017)	Convolutional neural network	Accurate	No way to be spatially invariant to the input data, cannot encode the orientation or position of the object, circumventing the problems needs adding more data
Miller (2021)	Conditional deep belief networks	Accurate	Require a large volume of data, circumventing the problems needs adding more data
Mathew et al. (2017)	Conditional deep belief networks	Accurate	Require a large volume of data, circumventing the problems needs adding more data
Shamout et al. (2022)	Conditional deep belief networks	True positive detection	Require a large volume of data, circumventing the problems needs adding more data
Liu et al. (2017)	Conditional deep belief networks	Precise	Require a large volume of data, circumventing the problems needs adding more data
Mehmood et al. (2019)	Conditional deep belief networks	Accurate	Require a large volume of data, circumventing the problems needs adding more data

(continued)

Table 1 (continued)

Authors and year	Features	Advantages	Disadvantages
Wang et al. (2017)	Deep neural network	True positive detection	Limited capacity to transfer data, lack of transparency, learning requires a large data sample, circumventing the problem requires using a large training dataset and an expert
Rehman et al. (2021)	Deep neural network	Accurate	Limited capacity to transfer data, lack of transparency, learning requires a large data sample, circumventing the problem requires using a large training dataset and an expert
Saxe & Berlin (2015)	Deep neural network	Low training time and detection accuracy	Limited capacity to transfer data, lack of transparency, learning requires a large data sample, circumventing the problem requires using a large training dataset and an expert
Matloob et al. (2021)	Deep neural network	Classification accuracy	Limited capacity to transfer data, lack of transparency, learning requires a large data sample, circumventing the problem requires using a large training dataset and an expert
Wu et al. (2017)	Deep neural network	Accuracy	Limited capacity to transfer data, lack of transparency, learning requires a large data sample, circumventing the problem requires using a large training dataset and an expert
Obaid (2021)	Stacked auto-encoder	Accuracy	Limited capacity to transfer data, lack of transparency, learning requires a large data sample, circumventing the problem requires using a large training dataset and an expert

(continued)

Table 1 (continued)

Authors and year	Features	Advantages	Disadvantages
Wei & Mendis (2016)	Stacked auto-encoder	Detection accuracy	Limited capacity to transfer data, lack of transparency, learning requires a large data sample, circumventing the problem requires using a large training dataset and an expert
Lee et al. (2021)	Stacked auto-encoder	Detection accuracy	Limited capacity to transfer data, lack of transparency, learning requires a large data sample, circumventing the problem requires using a large training dataset and an expert
Zolotukhin et al. (2016)	Stacked auto-encoder	Classification accuracy	Limited capacity to transfer data, lack of transparency, learning requires a large data sample, circumventing the problem requires using a large training dataset and an expert
Naqvi et al. (2021)	Relevance deep learning	False positives and detection accuracy	Limited capacity to transfer data, lack of transparency, learning requires a large data sample, circumventing the problem requires using a large training dataset and an expert
Hou et al. (2016)	Deep belief network	Accuracy	Limited capacity to transfer data, lack of transparency, learning requires a large data sample, circumventing the problem requires using a large training dataset and an expert
Kashif et al. (2021)	Deep belief network	F1-score	Limited capacity to transfer data, lack of transparency, learning requires a large data sample, circumventing the problem requires using a large training dataset and an expert

(continued)

Table 1 (continued)

Authors and year	Features	Advantages	Disadvantages
Diro & Chilamkurti (2018)	Deep belief network	True positive, accuracy	Limited capacity to transfer data, lack of transparency, learning requires a large data sample, circumventing the problem requires using a large training dataset and an expert
Suleman et al. (2021)	Deep belief network	Accuracy, recall, precision	Limited capacity to transfer data, lack of transparency, learning requires a large data sample, circumventing the problem requires using a large training dataset and an expert
Aminanto et al. (2018)	Deep belief network	Accuracy	Limited capacity to transfer data, lack of transparency, learning requires a large data sample, circumventing the problem requires using a large training dataset and an expert
Kalra et al. (2020)	Deep belief network	False positive, detection accuracy	Limited capacity to transfer data, lack of transparency, learning requires a large data sample, circumventing the problem requires using a large training dataset and an expert
Thing (2017)	Deep belief network	Recall, detection ratio	Limited capacity to transfer data, lack of transparency, learning requires a large data sample, circumventing the problem requires using a large training dataset and an expert

(continued)

Table 1 (continued)

Authors and year	Features	Advantages	Disadvantages
Salloum et al. (2020)	Sparse auto-encoder	False positive	Limited capacity to transfer data, lack of transparency, learning requires a large data sample, circumventing the problem requires using a large training dataset and an expert
Yuan et al. (2017)	Sparse auto-encoder	Time for number of packets running	Limited capacity to transfer data, lack of transparency, learning requires a large data sample, circumventing the problem requires using a large training dataset and an expert
Hasan et al. (2022)	Sparse auto-encoder	Precision, recall, F-1 score, accuracy	Limited capacity to transfer data, lack of transparency, learning requires a large data sample, circumventing the problem requires using a large training dataset and an expert
Vinayakumar et al. (2017)	Sparse auto-encoder	Precision, recall, F-1 score, accuracy	Limited capacity to transfer data, lack of transparency, learning requires a large data sample, circumventing the problem requires using a large training dataset and an expert
Radwan & Farouk (2021)	Recurrent neural network	False positive	Limited capacity to transfer data, lack of transparency, learning requires a large data sample, circumventing the problem requires using a large training dataset and an expert

(continued)

Table 1 (continued)

Authors and year	Features	Advantages	Disadvantages
Ishitaki et al. (2017)	Recurrent neural network	Detection positive	Limited capacity to transfer data, lack of transparency, learning requires a large data sample, circumventing the problem requires using a large training dataset and an expert
Guergov & Radwan (2021)	Recurrent neural network	Error rate	Limited capacity to transfer data, lack of transparency, learning requires a large data sample, circumventing the problem requires using a large training dataset and an expert
Javaid et al. (2016)	Recurrent neural network	False positive	Limited capacity to transfer data, lack of transparency, learning requires a large data sample, circumventing the problem requires using a large training dataset and an expert
Nuseir et al. (2021)	Recurrent neural network	False positive	Limited capacity to transfer data, lack of transparency, learning requires a large data sample, circumventing the problem requires using a large training dataset and an expert
Fiore et al. (2019)	Support vector machine	Accuracy	Limited capacity to transfer data, lack of transparency, learning requires a large data sample, circumventing the problem requires using a large training dataset and an expert

(continued)

Table 1 (continued)

Authors and year	Features	Advantages	Disadvantages
Farouk (2021)	Stacked de-noising auto-encoders	Accuracy	Limited capacity to transfer data, lack of transparency, learning requires a large data sample, circumventing the problem requires using a large training dataset and an expert
Taormina & Galelli (2017)	Recursive neural tensor network	Accuracy	Limited capacity to transfer data, lack of transparency, learning requires a large data sample, circumventing the problem requires using a large training dataset and an expert
Mondol (2021)	Recursive neural tensor network	Precision recall F-1 score	Limited capacity to transfer data, lack of transparency, learning requires a large data sample, circumventing the problem requires using a large training dataset and an expert
Shibahara et al. (2016)	Auto-encoder	Classification accuracy	Limited capacity to transfer data, lack of transparency, learning requires a large data sample, circumventing the problem requires using a large training dataset and an expert
Cruz (2021)	Auto-encoder	Classification accuracy	Limited capacity to transfer data, lack of transparency, learning requires a large data sample, circumventing the problem requires using a large training dataset and an expert

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An Integrated Cloud and Blockchain Enabled Platforms for Biomedical Research

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Abstract In the current pandemic scenario, healthcare data tends to be an important asset among organizations. The major challenge is to handle the data effectively while maintaining the privacy and security of the data. In a real-world, context healthcare data proves to be heterogeneous. Hence, managing such significance to big data has ardently laid numerous challenges among researchers and scientists around the globe. Cloud environment and blockchain technology can be discussed as usable platforms

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_111

which can deliver a comprehensive centralized data privacy system. In the current approach study, we have integrated both technologies to provide usability in medical systems. Further, we have also proposed and implemented a blockchain application with an integrated cloud-based environment regarding heterogeneous medical databases. The study is proposed in 2 phases to maintain the privacy and the accessibility of the data. The double-spending problem is also presented, as mentioned above, using Blockchain's consensus process. Each network node independently verifies the validity of individual transactions and entire blocks. As a result, there is no need to put faith in a single entity or other nodes. As a result, third parties are no longer required for network actions or blockchain management.

Keywords Blockchain technology · Cloud environment · Medical system · Healthcare databases

1 Introduction

In the recent era of digitization, data has exponentially grown from megabytes to terabytes. The challenge is to gather information from such volumes of data and provide an eccentric environment to maintain privacy and security (Alnazer et al., 2017; Hamadneh et al., 2021a, 2021b; Obaid, 2021; Shamout et al., 2022). Hence, a traditional computation system doesn't offer a paving technology to handle such generosity among the data (Ahmad et al., 2021; Alshurideh et al., 2020a, 2020b; Kurdi et al., 2020; Mehrez et al., 2021). We can say that blockchains are an emerging domain that may provide a substitute for outdated databases (Akhtar et al., 2021; Cruz, 2021; Guergov & Radwan, 2021; Khan, 2021). We may consider the different scenario in which domain may be used as a candidate solution Blockchain technology is a domain that offers us a global solution to our problems, which will create trust and guarantee transparency among several application domains (Alzoubi et al., 2020a, 2020b; Aziz & Aftab, 2021; Joghee et al., 2020). Hence, Blockchain manages privacy by maintaining centrally defined criteria. All connected chain members can check the centralized information by providing the right paths of the chain. Blockchain systems may have the capacity (Alzoubi & Ahmed, 2019; Alzoubi & Aziz, 2021; Alzoubi et al., 2022). The blockchain system is dependent on temperature conditions. During the documented and the transport, it assists in the cold chain. In this way, patients benefit from accessible documentation and are tampered with tracing the drugs flow transportation (Ali et al., 2022; Alzoubi et al., 2020a, 2020b; Mehmood, 2021).

The introduction of the Blockchain in the healthcare sector is primarily about increasing security and improving data protection. In addition to the possibilities of

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the Blockchain for doctors, authorities, and patients, the interaction of the data flow between patients and hospitals or service providers in the healthcare sector can also be significantly improved (Alshurideh et al., 2022; Hanaysha et al., 2021a, 2021b). The Blockchain can be an ideal solution wherever information has to be stored and passed on. Even when companies exchange data from patients in the healthcare sector, the Blockchain improves data protection and transmission security (Alsharari, 2021; Alzoubi & Yanamandra, 2020; Lee & Ahmed, 2021; Lee et al., 2022a, 2022b).

Another feature of Blockchain which unprecedently benefits end-users is smart contracts. The concept of smart contracts was introduced by Nick Szabo back in 1997 and is defined as a computer-based transaction protocol that implements the terms of a contract. Due to its properties, the Blockchain offers a suitable medium for implementing such contracts for the first time. Smart contracts are to be understood as computer programs that can make decisions when certain conditions are met. For this purpose, external information can be used as input through the smart contract, which then induces a certain action via the specified rules of the contract. The corresponding scripts with the contract details will be too stored in a specific address on the Blockchain (Alhamad et al., 2021; Ali et al., 2021; Alshurideh et al., 2020a, 2020b; Ghazal et al., 2021). If the specified external event occurs, a transaction is sent to the address, after that the terms of the contract are executed accordingly. Smart Contracts are tools with which human interactions are automated by executing, enforcing, verifying, and inhibiting contracts through algorithms. All interactions with the blockchain system, such as making payments, exchanging the digital key, or accessing the patient data, can be carried out by the user and the healthcare professional using a smartphone (Alzoubi, 2021a; Eli, 2021; Lee et al., 2022a, 2022b; Mehmood et al., 2019; Miller, 2021).

Health data management is crucial in the healthcare system. Their design may aid patients in receiving the correct diagnosis and avoiding drug errors. Cybercriminals had also turned their attention to patient data. Smart contracts can be used to correctly and safely manage patient health data (Al Ali, 2021; AlHamad et al., 2022; Mondol, 2021; Radwan & Farouk, 2021). Smart contracts will be used to store this information on a distributed ledger. When a patient needs to be transferred from one hospital to another, it can be done swiftly and efficiently without completing additional documents. Blockchain technology enables the patient's healthcare professional to examine his health data and medical records easily. Many hospitals and healthcare providers still use traditional databases. If these health data are saved in smart contracts and disseminated via Blockchain, they will be accessible to hospitals and research institutes worldwide. Smart contracts can also operate as gatekeepers, limiting access to data to only those with a private key, making it more accessible and transparent for both patients and providers (Alnuaimi et al., 2021; Alzoubi, 2021b; Farouk, 2021).

In Parallel, Blockchain can be implemented in patients' health records, which could be encrypted and stored in the Blockchain with a private key that only allows certain users access. Hence, efforts are aligned to ensure that research is conducted by HIPAA laws (securely and confidentially). Further, the study evidence can be stored in a blockchain and automatically sent to the payers as evidence of performance

(AlShamsi et al., 2021; Alshurideh, 2022; Alzoubi et al., 2021; Kashif et al., 2021). A directory could also be used for general health management such as drug monitoring, compliance with regulations, test results, and health product management to monitor the entire process. The patient data could be mapped in a digital contract for doctors and insurance companies. Hence, all the parties in the proposed contracts will be able to visualize the data at a glance; also, patients can decide individually which information they want to disclose (Alwan & Alshurideh, 2022; Hamadneh et al., 2021a, 2021b; Tariq et al., 2022a, 2022b).

There are several studies in the past conducted dealing with blockchain technology with varied application domains. We can say that Blockchain has unprecedently advanced and benefited biomedical research. For example, If the entire drug production cycle is handled in the Blockchain, all processes can be monitored. This includes production, transport, storage, and dispensing at the pharmacy (Al-Hamadi et al., 2021; Al-Naymat et al., 2021; Zitar, 2021). Manufacturers could check that the cold chain was adhered to, if necessary, and assign a QR code to the drugs. Patients can use this to verify the authenticity of medication and at the same time check the transport. In drug research, the Blockchain helps to obtain declarations of consent from testers more quickly and reliably (Al-Hamadi et al., 2015; Al Neaimi et al., 2020; Bibi et al., 2021). Here, too, data can be sent more easily between the various parties involved.

The advert facts and literature review show that blockchain technology has opened vast opportunities in several application domains. But certainly, medical systems are the need of time due to the current pandemic scenario. To address the factors related to healthcare application, the current study of approach is focused on shedding some light on the recent developments regarding the use of Blockchain in the context of public healthcare and discussing the workings and security features of blockchain technology in moderate detail. Further, we have also proposed and implemented a blockchain application with an integrated cloud-based environment regarding heterogeneous medical databases. The study is presented in 2 phases to maintain the privacy and the accessibility of the data.

In general, the paper's outline is discussed as an extensive literature study is conducted to understand the role of Blockchain in varied application domains. Then, a comprehensive framework is proposed in context with the medical system. Further, the study discusses the diverse impacts of Blockchain in the medical system. In the end, the conclusion and discussion is widely elaborated.

2 How Blockchain Works

A "blockchain" is a data structure in which data design is stored in an unchangeable manner. This takes place in the form of chained data blocks (hence the term "block" "chain"). Newly added data are regularly merged into a new block, provided with a data "fingerprint" (hash) and a timestamp or an ascending ordinal number (Al Hamadi et al., 2017; Aslam et al., 2021; Ghazal, 2021; Maasmi et al., 2021). In some

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blockchains, executable program logic, i.e., Smart Contracts, can also be saved in a forgery-proof manner.

To protect against tampering, exact copies are automatically generated and distributed via many independent computers, ideally globally distributed and operated by a wide variety of participants and organizations. Since the stored data is usually a log of transactions, it also comes from a distributed ledger, cashbook, or register, i.e., "Distributed Ledger Technology" (DLT). The hash of every data block in a blockchain is unique. Since the data fingerprint of the previous block is also taken into account when calculating this value, the hash of the newest block is also the data fingerprint of the entire Blockchain. This means that even the slightest change in older data is immediately noticeable when compared with other computers. Manipulation security is achieved with the help of automatic consensus building in the network.

As a distributed ledger, the Blockchain manages without a central authority, so the consistency of the data has to be ensured in another way. A new block to be appended must be identical on all computers involved in the network. To ensure this, certain conditions are specified which a block must meet to be attached to a blockchain or accepted by all nodes (Siddiqui et al., 2021). In the event of discrepancies, it is automatically determined based on a predefined algorithm which copies are discarded and recognized by all computers. This process is also called consensus-building. Traditionally, transferring values (e.g., amounts of money, property titles, certificates, ID cards, rights, etc.) requires intermediaries (e.g., banks or authorities) whom both transaction partners trust and who handle the transaction. Users of a blockchain trust its cryptographic protocol and that the majority of those involved (peers) behave honestly. In the future, distributed ledgers will take over intermediary functions in many application areas and thus enable a wide variety of peer-to-peer transactions ("trust through transparency") (Al-Dmour & Teahan, 2005). The concept of public-key cryptography was introduced in 1976 by Diffie and Hellman. An algorithm is used to generate a mathematically linked vital pair consisting of a private and a public key. This key pair can be used to create a digital signature. To do this, the sender signs or combines a message with his private key, which only he knows, and sends the resulting signed message to the recipient. He can now check the signed message with the sender's public key and thus verify the message's authenticity (if the two keys correspond). Overall, three goals can be achieved with a digital signature. Since only the sender knows the private key, the message's authenticity can be proven. In addition, the sender cannot deny having signed the message. Furthermore, the message cannot be changed unnoticed by the asymmetrical encryption, which guarantees its content integrity.

With the appropriate query tools often available online, the entire blockchain database can be searched and readout. If visibility is to be prevented, the data can also be encrypted and stored in the Blockchain. This leads to further challenges, such as the question of where the key material should be stored. In the case of public-permission less Blockchain, new data is not appended directly but initially forwarded to all computers in the network. After a few minutes, a computer "packs" all the accumulated data into a new block and attaches it to the Blockchain. Hash-secured data

can neither be deleted nor overwritten by individual participants. This is the most important unique selling point of blockchain technology, especially in public healthcare. Incorrect entries can always be corrected with a valid correction entry. Some blockchains only store simple information. The Bitcoin blockchain contains entries such as "Participant A transfers participant B two Bitcoins." Other blockchains offer more extensive functions: The Ethereum blockchain allows conditional transactions such as "After electronic confirmation of the delivery of the product P, A transfers the amount X to B." This enables business logic to be carried out automatically; this is known as a smart contract (Al-Dmour, 2016; Ali & Dmour, 2021; Zitar et al., 2021). With digital values stored on a DLT system, smart contracts are becoming a fundamental innovation for new business models. It should be noted that smart contracts are executed locally on each of the computers in the network. Compared to a central solution, smart contracts are very resource-intensive.

3 Integrated Network of Cloud and Blockchain for Medical System

In the past several studies are comprehended to understand the ease of technology in the real-world application domain. As we know, the current pandemic scenario has opened vast challenges among healthcare practitioners and scientists around the globe to determine the factors that can influence and improve healthcare costs. In comparison, the focus was to provide patients with utmost facilities with network capabilities. Hence, blockchain and cloud networks with healthcare databases can revolutionize administrators and healthcare professionals to work and enhance the captivity of their operations.

3.1 Development of Phase I Framework

The research framework was designed in 2 phases, Fig. 1 represents the first phase where the focus is to assimilate and regulate the factors responsible for sharing the information among healthcare professionals. Moreover, determining the benefits of technology can affluently impact the social and wellbeing of patients' healthcare.

3.1.1 Heterogeneous Medical Data

Patient data has immensely grown over the past decade, which has created massive challenges among researchers and scientists to design new adaptive technology. We may say that gathering the data from varied resources or heterogeneous has consolidated in the form of big data. This data has created a background to enhance our

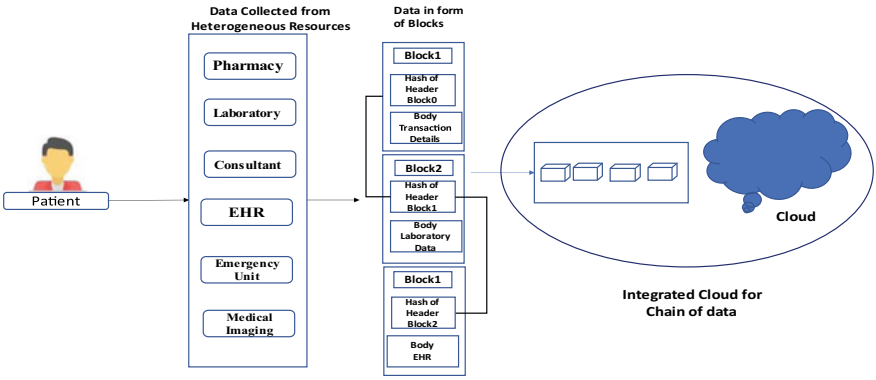

Fig. 1 The framework of phase I

technology to discover, analyze, and provide end-user services in a secure environment. Hence, Blockchain can be discussed as the technology which can cross many hindrances and give substantial privacy among the data shared. In Fig. 1, we have applied a coagulative blockchain and cloud computing approach in the healthcare system.

In the healthcare system, we can find data of several types such as patient symptoms, financial data, societal factors such as age, gender, origin, past abusive records, and others stored in the alphanumeric form. Moreover, audio, videos, imaging, including MRI, CT, Pet scan, and other aspects of data have different formats for storage. Then, we integrate the data from heterogeneous resources then we are submerged in the pool of data. Real-time accessibility of data in a private mode is the challenging factor; hence the Blockchain is the key technology that end-users can provide. I the current study of approach, we have designed a framework that can adhere and cope with the heterogeneous nature of data.

In the proposed approach, all the patient data was collected from varied heterogeneous resources such as Laboratory, Imaging data, Electronic Health Records (EHR) of the patients, Pharmacy data, and other clinical aspects of the patients. The first framework level extracts the data in different formats. It generates the data in blocks while uploading the same on the cloud-based architecture using recommender from the medical practitioners.

3.1.2 Blocks of Data

As we know, data has been gathered from disseminated resources, which has prudently influenced the medical system. Moreover, the data is stored in nodes where each node is subdivided into sub-headers to organize the data in the structured format eventually. The node consists of a header with a body; we can infer it to be a form of linked list where the body refers to having actual information or data of patient's

information. At the same time, the address of the previous node is stored in the hash value. The current scenario pertains to the flow of information from one end to another in a chain. This data network is flowing, which can alter the data with the flexibility of hashing technique and significant moment of nodes.

Similarly, Blockchain can be stated as a digital chain of records, where the links (blocks) of the chain are permanent records that rely on the previous link (block) to complete the document that is checked publicly through a network by machines (computers). The Blockchain contains one-way encryption so that the data, while publicly accessible and verified, remains secure and proprietary. This creates several security features that make it a leading approach in digital cryptography.

3.1.3 Integrated Network of Cloud and Blockchain

In general, the availability of medical data at a critical time can be essential for patient wellbeing. In several conditions, the monitoring of the patients can occur in a heterogeneous environment where the team of doctors from various hospitals needs to investigate the patients on different parameters. So, the challenge is to create an environment where patient healthcare data and financial transactions are easily maintained from one end to another. Adopted blockchain technology can play a crucial role in enhancing interaction among healthcare practitioners and providing a collaborative environment for end-users to handle such limitations.

Thanks to Blockchain, patients have more control over their medical records thanks to Blockchain, and it could also be used to transmit real-time data from wearables and medical equipment with doctors. Using the technology's secure network, medical gadgets might be tracked correctly from manufacturing through installation during patient operations. Regulatory authorities, who would gain from mandating the integration of blockchain technology to simplify medical device approvals and post-market surveillance, are likely to push blockchain adoption by medical device manufacturers. Blockchain will make it easier to collect and review patient data and medical device performance data during clinical trials. Clinical trial data could also be manipulated or falsified with the use of technology.

Further, blockchains make a distinction between public and private variants depending on the visibility of the data. In the personal variant, visibility is limited to authorized participants. The right to append blocks to the chain can be controlled in both cases: one speaks here of the properties "permissioned" or "permission-less." Here, public permissioned Blockchain is used in the public healthcare scenario, while a more restricted version is employed in biomedical research. In all cases, data stored on a blockchain can be encrypted so that the participants do the transactions but cannot see the content transported in it. The Blockchain in a different form to access the data can be discussed as below:

1. **Public Permissionless Blockchain**: All entries are open, while all participants remain anonymous or pseudonymous. Examples: Bitcoin blockchain, Ethereum, EW blockchain.

2. **Public Permissioned Blockchain**: Access for participants is controlled by technology. With this type of Blockchain, the system's end users are subject to the specified framework conditions and rules.
3. **Private Permissioned Blockchain**: All participants are known. Since the participants often know each other and their number is usually lower, reaching a consensus is simplified so that the creation of blocks is speedy.
4. **Private Permissionless Blockchain**: This type of Blockchain is suspected of being out for the snowball effect and is more likely to pursue fraudulent purposes.

Moreover, cloud-based computing and Blockchain can quickly investigate, store, and provide a private environment for a healthcare-based system. The cloud-based system has attracted several users to store the data, process the data, and deliver the services to end-users as per the need of the time. Nowadays, it has attracted several small and large organizations where they pay for the data or services which are required at an essential time. Hence, forfeited benefiting many organizations in terms of cost while enhancing the flexibility of time and availability. In the current proposed study, we have integrated the cloud and blockchain technology to provide the healthcare system with the flexibility of data storage, analysis of the study, and maintaining the private environments for patients' data.

3.2 Framework for Phase II

In a previous phase I, data is generated from patients and further stored in nodes in a cloud-based interactive environment. However, the challenge is to access the data while maintaining privacy and availability to end-users. Hence, blockchain technology can be easily applied to medical systems as it can easily allow a transaction to work securely while maintaining privacy among the user's access. In Fig. 2, a representative model depicts the flow of information patients' data in the distributed environment where confidentiality and privacy are maintained. For example, if the insurance companies want to access the patient's records, the organization needs to send a request to a cloud-based system. Where the receiver will access the request and confirm the ownership of data while verifying through the e-stamp. The e-stamp is the value that is generated during the transaction.

Although data on a blockchain is viewable by everyone, it is stored encrypted (depending on the technology) or for data security purposes. Encryption is often accomplished through the use of tried-and-true technologies such as public/private key cryptography. Participants are responsible for their key and identity maintenance, whether physicians or patients; a blockchain does not set any requirements for this. In the event of a private-permissioned blockchain, the patient's data can also be packaged behind a firewall, further restricting access. It should be highlighted at this time that future breakthroughs in the realm of quantum computing might significantly call into question the security of encryption and distributed ledger technology. Because the volumes of data recorded on a blockchain are tiny, it is common for merely

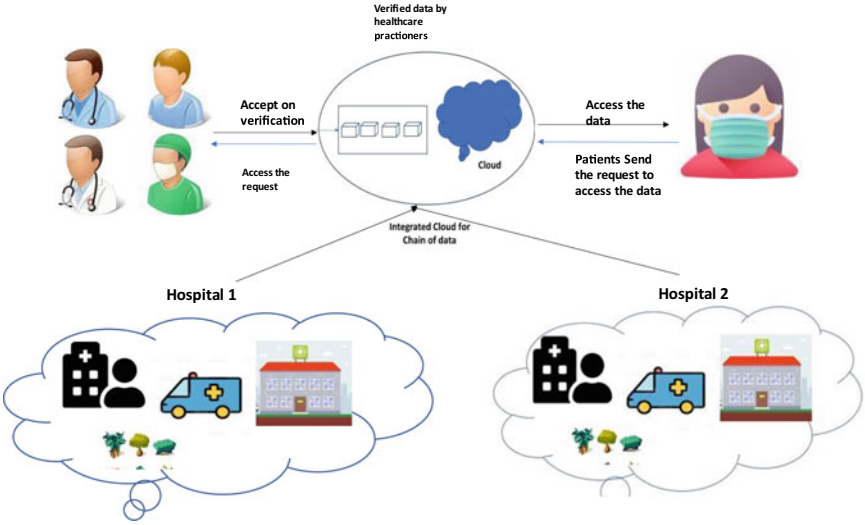

Fig. 2 The framework of phase II

a mathematical summary of the data to be placed there (usually as a hash). The chain member must then find out how to store the original data on safe servers but may subsequently establish its status at a particular time by making an entry in the Blockchain. All notarial applications are based on this.

Medical information is available with a high degree of certainty at all times due to the sheer technology, distributed, and fragmented storage, provided that a sufficient number of nodes keep the complete data set available so that partial failures of the underlying network can also be tolerated. Targeted attacks on a single central point are not feasible, while an attacker can restrict availability in private blockchains with considerable effort. A higher connection rate strengthens the network's resistance to failures caused by targeted attacks or technical faults.

To affect a blockchain of the public-permission kind with proof-of-work as a whole, an attacker must have control of the majority of all computers. It is problematic and quickly becomes apparent when the code is released as open-source and spreads across different nations, jurisdictions, and operators. The bulk of attacks on smaller systems have already succeeded. The great majority of attacks, on the other hand, are phishing efforts that steal access details. Mining malware, selfish mining, distributed denial of service, hacked crypto wallets, transfer Trojans, and other indirect attack scenarios are also feasible.

Hence, an identical architecture can be followed in the distributed environment of the medical system. Several hospitals can treat a patient while maintaining the financial ecosystem of the patients and providing flexibility among the healthcare practitioners to access the patients' data and provide comprehensive services to end-users.

Blockchain and IoT Enabled Healthcare

In the field of medical technology, various applications of Blockchain and smart contract ideas are conceivable. Although no concrete application scenarios have yet been created and published, research interest has already been aroused. In the age of digital medicine, more and more health-related data are available in different years. This leads to longitudinal sensor data such as radiological images, clinical information, outstanding patient files, and compassionate data, for example, genetic tests.

Modern preventive medicine requires evaluating such data across the population, for example, using current model-free statistics (deep learning). Traditional modeling in this environment is not used since data cannot be collected and made available in a centralized manner. There are no socially accepted methods of secure data storage and secure usage monitoring. One way out could be mechanisms that allow the owner of the data transactional, auditable control over its use. That is precisely the value proposition of blockchain technology. Not all blockchain characteristics are required; for example, it is unnecessary to decentralize the verification. According to the prevailing opinion, there are at least three significant technical challenges to be mastered:

1. **Complete data usage monitoring**. It must be demonstrably excluded that data usage bypasses the system. This can also make it necessary to certify secure hardware.
2. **Group and person-specific usage permits**. It must be possible to restrict the use of data to certain people or institutions or specific parts of the data.
3. **Complete decentralized data and logs**. Data must be transported across systems in a scenario where data is kept decentrally (in hospitals, insurance firms, mobile devices, etc.). Securing the communication from unauthorised usage is a significant problem.

In all three areas, some projects and approaches could be a basis for opening up a new type of access to the area of personalized, data-driven health management.

Data-centric medicine is the name for this type of tailored therapy. Today, data are abundant on a patient, and it continues to grow dramatically. Whereas a laboratory result and an X-ray image may have been the basis of a medical judgment in the past, many metrics will be used to produce an entire picture for medical recommendations in the future. In the context of patient management, this will also modify structures and processes. In the whole therapeutic chain, patient data takes the lead. The rising specialization of professions is also driven by data-based knowledge about a patient's health and the potential diagnoses, remedies, or preventive actions.

Traditional providers in the health sector and new suppliers such as companies in the food industry, sports, fitness, medical technology, or the IT sector will constitute the nodes of dynamic health networks that revolve around the individual. The rate at which people make decisions about preventative measures or therapies is increasing, as is the number of new products and health services available. Furthermore, this

type of tailored medicine allows you to find new places for health and arrange health themes flexibly, such as at home, in the car, in a restaurant, or at work.

As a result, data protection in the future must imply that patients have control over their data and decide how it is handled. He must trust that his data is constantly current and accessible while also being safeguarded from illegal third-party access. Blockchain technology plays a critical role in this scenario. The digital currency Bitcoin is the most well-known and oldest blockchain application. It is no longer enough to attack a single server to steal or alter sensitive patient data; now, every single computer in the Blockchain must be hacked. As a result, the system is highly safe and appropriate for sending sensitive health or medical information.

Apart from personal healthcare, Blockchain applications have proven useful in clinical studies, especially those involving several centers, placing high logistics and documentation demands. By using a blockchain, the history of the events and the existence of the data can be proven beyond doubt. Subsequent changes are practically impossible. This helps in monitoring and controlling clinical trials. It then makes it easier for licensing authorities to check the integrity of the data and thus evaluate the study results.

A case that exemplifies the use of Blockchain is in the scope of the supply chain is the cold chain of drugs. To guarantee the effectiveness of certain medications, it is necessary to transport them under precise temperature conditions. The negative consequences of an ineffective drug can be financially far-reaching for companies and, most importantly, ultimate for patients. Guaranteeing a constant cold chain and documenting it remains a crucial challenge to this day. The complicated transport logistics, in which many different parties and systems are involved, is inefficient and prone to problems such as lack of transparency and traceability of the transport routes and temperature conditions. It can result in retailers receiving drugs that they cannot understand the quality of and patients ultimately taking ineffective drugs.

While the sensor technology for the control of drugs is already partially available and the interface to the Internet of Things can ensure that the corresponding analysis data is fed into digital systems, a piece of the puzzle is missing for a holistic solution to the problem. This Blockchain can create trust between the individual participants in the supply chain and the end consumer. Without a blockchain, the information about the medication is stored and passed on to the consumer. Central servers or even in paper form. This creates a dependency on each intermediary involved in the supply chain—government officials, customs, banks, transportation and storage companies, etc. Coordinating all of these parties is also highly time-consuming and costly.

Another critical point here is increasing the efficiency of the supply chain, especially in terms of administration and payment. Here, Smart Contracts can call necessary information, and payments are automatically processed between the respective parties. For example, a contaminated medication package discovered afterward can trigger a corresponding complaint payment directly. Salaries and fees to transport companies can also be paid directly upon successful delivery.

4 Conclusion

While Blockchain promises to improve interoperability, security, and data protection, its limits must be recognized. The Blockchain is not intended to replace existing databases. Furthermore, the solutions are not appropriate for large amounts of data that require exclusive access inside a single firm. Blockchain solutions are designed to capture specific transaction data and distribute it to many users in a network where transparency and data security are critical.

The combination of a decentralized peer-to-peer network and a consensus technique for determining the state of the Blockchain offers up a flood of new possibilities. Because all network users often replicate both the Blockchain and individual processes such as digital signature verification, there is no single point of failure inside the network. This demonstrates that both network failure security and data availability are high. The consensus process also avoids the previously noted double-spending concern. Each network node separately verifies individual transactions and whole blocks. As a result, there is no need for trust in a single entity or other nodes; as a result, third parties are obsolete for network actions and blockchain maintenance.

Blockchain can be a game-changer in the healthcare sector due to its versatility and security. Blockchain as a forerunner in safe digital infrastructure Blockchain technology has several applications in the healthcare field. However, it is not yet thoroughly developed, nor is it a panacea that can be used immediately. First and foremost, several technological, organizational, and behavioral economic difficulties must be overcome before healthcare providers can adopt a blockchain tailored to the healthcare sector.

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Analysis of Issues Affecting IoT, AI, and Blockchain Convergence

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Abstract The purpose of this project was to appraise the integration or convergence issues influencing the mutual functioning of blockchain, AI, and IoT. The study argued that the recent developments in the field of IoT and blockchain prediction have involved the integration of innumerable classification schemes to establish a hybrid model. The introduction of the hybrid technique relies on the prediction performance that strives to override the limitations of any available architectural

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_112

scheme. This study offers a comprehensive exploratory appraisal of the issues influencing the successful integration of IoT and blockchain in regards to functionality and effectiveness of security, trust, and flawless communication issues. The exploratory research methodology was used in analyzing the issues affecting the integration of blockchain, artificial intelligence (AI), and the internet of things (IoT). The findings indicated that the integration challenges influencing the effective operations of blockchain, AI, and IoT as a single system involve security, scalability, accountability, and trust of communications. The study recommends that successful and effective integration will enhance the development of new business models as well as the digital transformation of market corporations. Accordingly, new approaches to convergence should ensure that executives address the new technology demands to obtain significant gains in efficiency.

Keywords Artificial intelligence · Internet of things · Blockchain convergence

1 Introduction

New developments in the integration frameworks between IoT and blockchain in different fields have sparked debates concerning the actual framework that should be adopted by firms desiring to benefit from the convergence of the two technologies (Akhtar et al., 2021; Al Ali, 2021; Alhamad et al., 2021; AlHamad et al., 2022). As one of the principal concepts guiding new prospects of industrial revolution, the Internet of Things (IoT) has achieved immeasurable milestones. Globally, the projected growth of IoT was about $170 billion in 2017 and is expected to be about $560 billion by end of the financial year 2022 (Ali et al., 2022; Alnazer et al., 2017; Alnuaimi et al., 2021; Alsharari, 2021; Alshurideh et al., 2022). Although countless professionals have indicated that IoT is the new industrial revolution, key challenges have affected the performance of IoT, starting from the ancient days in which there was the lack of a protected ecosystem covering all the construction blocks of IoT design as well as the scalability issues affecting the entire system. The number of devices operating in any IoT system has been one of the primary issues affecting the performance of IoT since its introduction.

It is commendable that the IoT has enhanced a common operating picture (COP) handling many applications and aspects of modern day life (Alshurideh et al., 2020; Alzoubi, 2021a, 2021b; Alzoubi et al., 2020a, 2020b, 2022). Blockchain, in this regard, has enhanced the effectiveness of COP because it has advanced the operations of wireless network and sensor devices that could not otherwise communicate via the conventional IoT network. Blockchain, artificial intelligence (AI), and IoT are the principal technologies that have driven the next phase of digital transformation. It is projected that these technologies will enable for the creation of new business models, including autonomous agents, digital version of IoT, receiving or sending money via blockchain technology, and autonomous decision-making as independent agents of economy.

The IoT has enabled a complex connection of things or objects, powered by sensing, communication units, and processing, to identify physical events, interact with their environments, and exchange data. The objective of such interactions is to monitor processes or make decisions concerning events requiring human interventions. Perhaps the most renowned inspirations related to the rise of IoT systems was the need to foster the real-time information collection as well as the need to offer remote and automatic control mechanisms that have replaced current conventional control and monitoring systems across industries (Alzoubi & Ahmed, 2019; Alzoubi & Aziz, 2021; Alzoubi & Yanamandra, 2020; Alzoubi et al., 2020a, 2020b, 2021a, 2021b). The integration between IoT, AI, and blockchain will introduce a new system architecture that will control and advance most of the ineffective procedures associated with the welfare of humankind.

2 Theoretical Framework

The theoretical framework adopted in this study considered the limitations of the existing shreds of research on the most effective convergence architecture for AI, blockchain, and IoT. The current research, in this regard, utilizes generalized philosophies and theories concerning the effectiveness of convergence between the three aspects of modern industrialization, including blockchain, AI, and IoT (Aziz & Aftab, 2021; Cruz, 2021; Eli, 2021; Farouk, 2021; Ghazal et al., 2021b). The theories considered in this depends on the fact that the distributive ledger aspect of blockchain is one of the solutions for the existing security and privacy challenges.

2.1 Operational Definitions

- *IoT*—refers to the Internet of Things
- *COP*—denotes common operating picture
- *AI*—refers to artificial intelligence
- *Blockchain*—defines the digital transaction ledger that is often distributed or duplicated across the whole network of devices and computers operating in the chain of blocks.

2.2 Industry Description

The general industry guiding the integration of IoT, AI, and blockchain has produced innumerable scales of information requiring power, network connectivity, storage, and processing (Alhashmi et al., 2020; Al Shebli et al., 2021; AlShamsi et al., 2021; Nuseir et al., 2021; Yousuf et al., 2021). The objective of convergence, in this regard,

is to transform available data into meaningful services and information (Alshurideh, 2022; Alwan & Alshurideh, 2022; Tariq et al., 2022a, 2022b; Emad Tariq et al., 2022a, 2022b). Along with concerns such as network scalability and reliable connectivity, data privacy and cybersecurity are issues of critical importance regarding the networks serving IoT and related systems (Guergov & Radwan, 2021; Hamadneh et al., 2021; Hanaysha et al., 2021a, 2021b; Joghee et al., 2020). The current industry involves centralized designs that have widely been used to connect, authorize, and authenticate different IoT network nodes.

3 Literature Review

The integration and performance issues affecting convergence of blockchain with the Internet of Things (IoT) has been addressed by many scholars. One of the main concerns of the issues affecting the seamless integration involve the fact that integrating these technologies focused on the prediction performance by filling the gap of limited literatures on the previous classification or convergence techniques. In modern world, artificial intelligence, IoT, and blockchain technologies have been acknowledged as innovations that can promote the existing business processes, disrupt entire market economies, and establish new business models. For instance, blockchain can enhance business process efficiency, security, transparency, and trust because of its decentralized, distributed, and shared ledger (Kashif et al., 2021; Khan, 2021; Lee & Ahmed, 2021; Lee et al., 2022a, 2022b).

Issues affecting convergence or integration between AI blockchain, and IoT has often been neglected based on many factors. For example, these three technologies are often used separately and selectively based on the demands of a specific firm. These innovations, however, should be implemented collectively now and in the future. One potential integration platform between these technologies is the use of IoT to provide and solicit data, with blockchain offering the setup rules of engagement and infrastructure while the AI maximizing the rules and process optimization.

Information process integration for security, trust, and seamless flow is one of the principal objectives of connection IoT, AI, and blockchain. There are many solutions for addressing the vulnerabilities and threats affecting the operations of IoT. IoT has played a crucial role in the daily organization level by ensuring the ease of working in diverse enterprises. Accordingly, the threat level existing in IoT devices is relatively high, indicating that the assessment and integration demands of the different models must be guaranteed to ensure orientation (Mehmood, 2021; Mehmood et al., 2019; Miller, 2021; Mondol, 2021; Obaid, 2021). Because IoT security is critical commensurate with the activities of hackers and malicious users, it is arguable the current architectures are often prone to attacks.

Convergence between AI, blockchain, and IoT has also been discussed by several shreds of literature. It is outlined that the use of AI, along with the abilities of IoT has enhanced treatments targeting patients suffering from Hepatitis C, a blood-borne infection that is often asymptomatic in the initial phases. The progression of hepatitis

C throughout the final phases often complicates the treatment and diagnosis process. Accordingly, a system based on AI and machine learning algorithms can assist healthcare providers in offering effective diagnoses in the early stages (Radwan & Farouk, 2021; Shamout et al., 2022). Based on the effectiveness of the blockchain in ensuring seamless, secure, and confirmed flow of information, it is arguable that the convergence of AI, blockchain, and IoT can significantly enhance the services given to patients suffering from hepatitis C.

4 Problem Statement, Research Gap, Research Contribution

Many pieces of research have tackled the issues, capabilities, benefits, and challenges facing the integration of AI, blockchain, and IoT. The existing studies, however, have only focused on particular areas, including health, finance, and agriculture, with finance being at the forefront of most emerging studies (Afifi et al., 2020; Al Batayneh et al., 2021; Ali et al., 2021; Alzoubi et al., 2021a). Despite the evident success of the convergence of blockchain with IoT in some of these fields, the analysis of converging AI, blockchain, and IoT has not been addressed in most of the existing bodies of literature. Accordingly, this study strives to determine the opportunities and challenges of integrating these three technologies using the best architectural model to enhance the accountability and accuracy of offering a broad range of services.

4.1 Research Model and Hypotheses

The analytical approach was considered as the best research design for this research. An analytical mechanism denotes the application of appraisals to decipher an issue down to its specific elements appropriate for finding a solution. Generally, the analytical approach is also referred to as formal analysis (Ghazal, 2021; Ghazal et al., 2021a, 2021c, 2021d). The primary challenge linked with the analytic approach, however, is that the existing tools are limited to the specific problems they can identify and solve. The approach adopted in this study is founded on the fact that the issues influencing integration between IoT, blockchain, and AI include the common elements such as efficiency, trust, accuracy, and scalability. Commensurate, the research design or model hypothesizes that integrating the three technologies can produce significant outcomes for organizations over time.

4.2 Methodology and Research Design

The adopted methodology was the quantitative research design. The selected research method focused on the performance of organizations that have implemented the AI, blockchain, and IoT in delivering services to public. Quantitative research was important for this study because it is crucial to identifying trends and averages to predict or evaluate causal associations that generalizes outcomes to a broader population in the end (Ghazal et al., 2013; Kalra et al., 2020; Khan et al., 2021a, 2021b). This research method was adopted as an experimental and correlational research technique because it formally examines the predictions or hypotheses based on statistics.

Based on the required data to perform a comprehensive quantitative analysis of the data on convergence issues affecting the integration of blockchain, Ai, and IoT, trust issues were the major element involved in the process. Trust is one of the primary concerns that has affected the integration of blockchain with IoT and AI. The quantitative approach, in this regard, involved the different procedural steps appropriate to the existing study. Principally, the advantage of using a quantitative research method is that the design is necessary regarding the use of factual data needed to address research questions.

In the process of determining the most appropriate quantitative method for the study, the study relied on the proportion supporting the assisted perception, which concerned the distribution of respondents according to age, residence, household income, and marital status, among others (Lee et al., 2021; Matloob et al., 2021; Naqvi et al., 2021). Additionally, the study data focused on the number of companies that have performed based on issues such as level of education and understanding of key issues guiding data use and the need for historical evidence.

4.3 Population/Sample/Unit of Analysis

The sampling, population, and unit of analysis was regarded as one of the fundamental elements of the study. In this research, it was considered that the companies that have implemented some of the suggested frameworks have understood some of the most influential elements, including, among others, the challenges, benefits, and opportunities associated with any of the emerging issues. Regarding the study and associated measures, it is arguable that the study determined the efficiency of the suggested approach because of the urgent need to foster the transaction rate occurring through blockchain transactions.

According to the exploratory design of the suggested framework, this study considered the fact that the efficiency of any applicable approach should follow the contribution of the following specific elements: transaction efficiency (described as the study equation—Eq. 1), n (number of business transactions happening through the integrated AI, IoT, and blockchain platforms), communications trust via trust (t), and the nature of security associated with the transactions (s). It is noteworthy that

this model relies on the findings and design of the study conducted by Ghazal et al., in which the analysis relied on the equation outlined below

$$\text{Effectivity of performance} = s + n + t\,(n) \tag{1}$$

The inclusion of n depends on the fact that the data used in the appraisal relied on the procedural developments of blockchain in the development of convergence metrics between AI, blockchain, and IoT. In one of the papers published by the individuals supporting the convergence of blockchain, AI, and IoT, Ghazal et al. argue that the computation of the immediate communication trust focuses on enhancing the trust of consumers concerning the most detailed model of the blockchain.

5 Analyzing Data

Equation 1 presented above outlines all the variables that have been used in presenting all the data aspects in this study. Accordingly, once this process improves, it is arguable that the integrated architecture covering convergence of IoT, AI, and blockchain will outline a comprehensive sequence of tests to determine the accuracy of handling the challenges influencing the existing block chain models. In this study, the immediate test concerned the computation of trust transaction that majorly focused on the capacity of companies to improve the level of trust in the suggested blockchain models. It is arguable that this aspect was obtained via seeking the attitudes of the different users concerning their ability and capacities to obtain the outlined requirements.

The data model, commensurate with the qualitative analysis study has many inferences. Firstly, the level of consumer/customer trust is determined by adding the scale of successful transactions (St) to the number of unsuccessful transactions (Zt). The outcome of this figure is divided by tt (the aggregate or total transactions). In this regard, Eq. 2 provides the actual number of transactions associated with any type of transaction.

$$\text{T or transactions trust} = (St + Zt)/tt \tag{2}$$

Based on the equation above, it is difficult to determine the security of the transactions that can happen without allowing or understanding of the detected threats. In this regard, it is arguable that the threat numbers is computed by dividing ts (solved threats) with the overall risks or threats identified in the entire convergence system.

The number of secure transactions following the convergence of AI, IoT, and blockchain (S) is denoted by Eq. 3:

$$S = (td - ts)/td \tag{3}$$

S = (td –ts)/td. Which reflects the number of transactions as

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N = transaction days (dt)/average daily transaction (adt); that is:
N = 9dt/adt.

5.1 Discussion of the Results

It is arguable that one of the many challenges affecting effective integration of AI, IoT, and blockchain is the existence of heterogeneous alternative outlining the variety of IoT devices and applications that needs to integrate AI and blockchain with IoT tech founded on their requirements and demands (Rehman et al., 2021; Suleman et al., 2021). Generally, these alternatives are only founded on particular use cases that cannot suit a broad range of devices and applications in this specific sector.

As a result, new studies should advocate for the development of a set of standards and protocols that can support the essential and basic needs of all IoT devices and applications rather than introducing applications/devices that can only operate via IoT networks. The combined potential of AI, IoT, and blockchain is immeasurable. Based on existing kinds of studies, it is arguable that the amalgamation of AI, IoT, and blockchain technology can unlock several new business architectures for the accrual of funds from IoT devices and applications. The results presented in the formulas and considerations outlined above resonates with the fact that the security of transactions have the accuracy that reflect the percentages produced by the following formulas. When comparing the models, it is appropriate that the architecture controlling the design of the tables indicate centralization as about 100% of the model. These results indicate that either of the algorithms applicable in the development of a perfect architecture can help address all the concerns of blockchain, AI, and IoT convergence in both the short and long-terms.

6 Conclusions and Recommendations

The objective of this study was to assess the most recent and adopted architectures of blockchain. The analysis involved comparing the most popular, recent, and interesting consensus algorithms as well as evaluating the integration between IoT, AI, and blockchain via illustrating the existing field research. The paper also offered a comprehensive overview of the disruptive studies on the topic that current authors have continued to investigate. The findings indicated that the convergence between AI, blockchain, and IoT can enhance the adequacy of computational level as well as efficiency in optimizing the energy consumption of connected devices. AI, IoT, and blockchain are technologies that will continue to be integrated in myriad dimensions. This paper contends that the integration of these innovative models will occur because services, products, and business models will benefit from the diversity of these technologies. Generally, these business models can be widely adopted by any independent agent, including cameras, trucks, machines, cars, and numerous sensors.

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Breast Cancer Prediction Using Machine Learning and Image Processing Optimization

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Abstract In this study, it is wanted to implement Naïve Bayes data mining techniques on a dataset gained from digitized Image of fine needle aspirate (or FNA) belonged to benign and malignant type of breast tumors. One of the most important factors causing cancers in the females, which can be measured from sample after maintaining in several hours' laboratory sample preparation at certain condition. As an alternative, Image processing can be substituted by measuring the geometrical features of FNA are well adopted economically and efficiently.

Keywords Data science · Female cancer tumor · Naïve Bayes · Clustering

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_113

1 Introduction

Despite of the fact that planar feature separation is the main point discussed on the literature, we would like all feature in a standalone model to use Naïve Base Prediction modelling along with the evaluation by a separate testing dataset (Akhtar et al., 2021; Al Ali, 2021; AlHamad et al., 2022). The objective is not only to evaluate the prediction on the cancer dataset but also to check if Bayes Naïve is a good substitute for feature extraction (Alnuaimi et al., 2021; Alsharari, 2021; Alshurideh et al., 2020a, 2020b, 2022; Alzoubi, 2021a, 2021b). The most important required libraries are discussed in the following section.

Naïve Bayes is the method used in Machine learning for the classification of two or more objects which are very similar to variance and regression analysis dependent variable is linearly relate to the other variables (Akour et al., 2021; Al Kurdi et al., 2021; Alhamad et al., 2021; Ali et al., 2021, 2022; Alnazer et al., 2017; Alshurideh et al., 2020a; Salloum et al., 2020). Technically this algorithm using Bayes conditional probability:

- C is the class label:
  - C ϵ {C1, C2, … Cn}
- A is the observed object attributes
  - A = (a1, a2, … am)
  - P(C | A) is the probability of C given A is observed Called the conditional probability.

For observed attributes A = (a1, a2, … am), we want to compute and assign the classifier, Ci, with the largest P(Ci|A).

Two simplifications to the calculations.

Apply naïve assumption—each aj is conditionally independent of each other, then Denominator P(a1, a2, … am) is a constant and can be ignored.

In this paper, the essential data preprocessing stages are described in Sect. 2 then in Sect. 3 the configuration of Python for the LDA analysis are explained. Modelling methods is the subject of Sect. 4 and their tuning parameters are described in Sect. 5. The results are shown for the classification accuracy are discussed and the confusion matrix is represented. At last, the results are summarized and the usage of the Machine Deep Learning in Tumor Dataset classification are discussed in the conclusion.

2 Dataset Description

A. Dataset Description: The dataset features are consisted of 10 * 3 features according to ten parameter's Mean, Standard Error and Worst Value as follow:

(a) radius (mean of distances from center to points on the perimeter)

(b) texture (standard deviation of gray-scale values)
(c) perimeter
(d) area
(e) smoothness (local variation in radius lengths)
(f) compactness (perimeter^2/area − 1.0)
(g) concavity (severity of concave portions of the contour)
(h) concave points (number of concave portions of the contour)
(i) symmetry
(j) fractal dimension ("coastline approximation" − 1).

These parameters are gained by Image Processing software. This method consisted of the following steps:

1. Kernel Boundary Estimation with image processing
2. Geometrical estimation of parameter statistical
3. Gradual Optimization by Kernel Estimation.

B. Identifying Python tools and libraries

For this module we will describe the required libraries and tools for python framework which can model the data as well as doing all data preparation. The code itself will be provided in html and pdf formats:

1. libraries for arraying algebra, Density and Probability scatters

   (a) pandas
   (b) numpy
   (c) plotly
   (d) os
   (e) seaborn
   (f) imblearn
   (g) plt
   (h) scatter_matrix
   (i) sklearn.

2. sklearn libraries for data preparation

   (a) train_test_split
   (b) preprocessing
   (c) LabelEncoder
   (d) RobustScaler.

3. sklearn libraries for data mining, validation and reporting

   (a) BernoulliNB
   (b) metrics
   (c) classification_report
   (d) confusion_matrix

(e) accuracy_score.

In Tumor dataset 30 attributes are applied in the Gaussian Naïve Bayes to predict one target variable. At first data should imported in Jupiter notebook for further preparation by panda's library function read_csv.

All variables are real number other than diagnosis and ID which is integer which should be dropped from the variable raw_data and moved to train_raw. These variables' histograms are shown in Figs. 1 and 2.

3 Methodology

We have used python 3.6 to import the dataset into Jupyter Notebook. The details of results of coding within the description of all attributes are attached in the Appendix I; The distribution of diagnosis (target) is shown in Fig. 3 which should be drop to form to distinct variables X and then only diagnosis moved to variable y. Afterwards, the train_raw is splitted into train/test partitions with X_train, X_test, y_train and y_test. The train X_train has 398 with 30 columns while y_train would be 398with one column. On the other hand, the X_test has 171 records of data. The result of Gaussian fit function would be exported to pred variable.

After these preparation step test and train should be standardized to reduce the overfitting bias (Alzoubi & Aziz, 2021; Alzoubi & Yanamandra, 2020; Alzoubi et al., 2020a, 2020b, 2022; Nuseir et al., 2021). For this purpose, we have imported RobustScaler (Al-Hamadi et al., 2015, 2021; Ali & Dmour, 2021; Al-Naymat et al., 2021; Aslam et al., 2021; Bibi et al., 2021; Ghazal, 2021). The Robust scaler use a transform and fit functions which is robust to outlier and remove the median and scale all features (Alzoubi & Ahmed, 2019; Aziz & Aftab, 2021; Alzoubi et al., 2020a, 2020b, 2021; Cruz, 2021; Eli, 2021). The correlation map was also visualized in Fig. 4. The advantage is that it shows the range of variables with their color (Maasmi et al., 2021; Siddiqui et al., 2021; Zitar, 2021; Zitar et al., 2021).

4 Results

In the following a training table layout that allows visualization of the performance of Naïve Bayes model are shown.

Accuracy on train set 0.9422110552763819

[[2427]

[16133]]

	precision	recall	f1-score	support
B	0.94	0.97	0.95	249
M	0.95	0.89	0.92	149

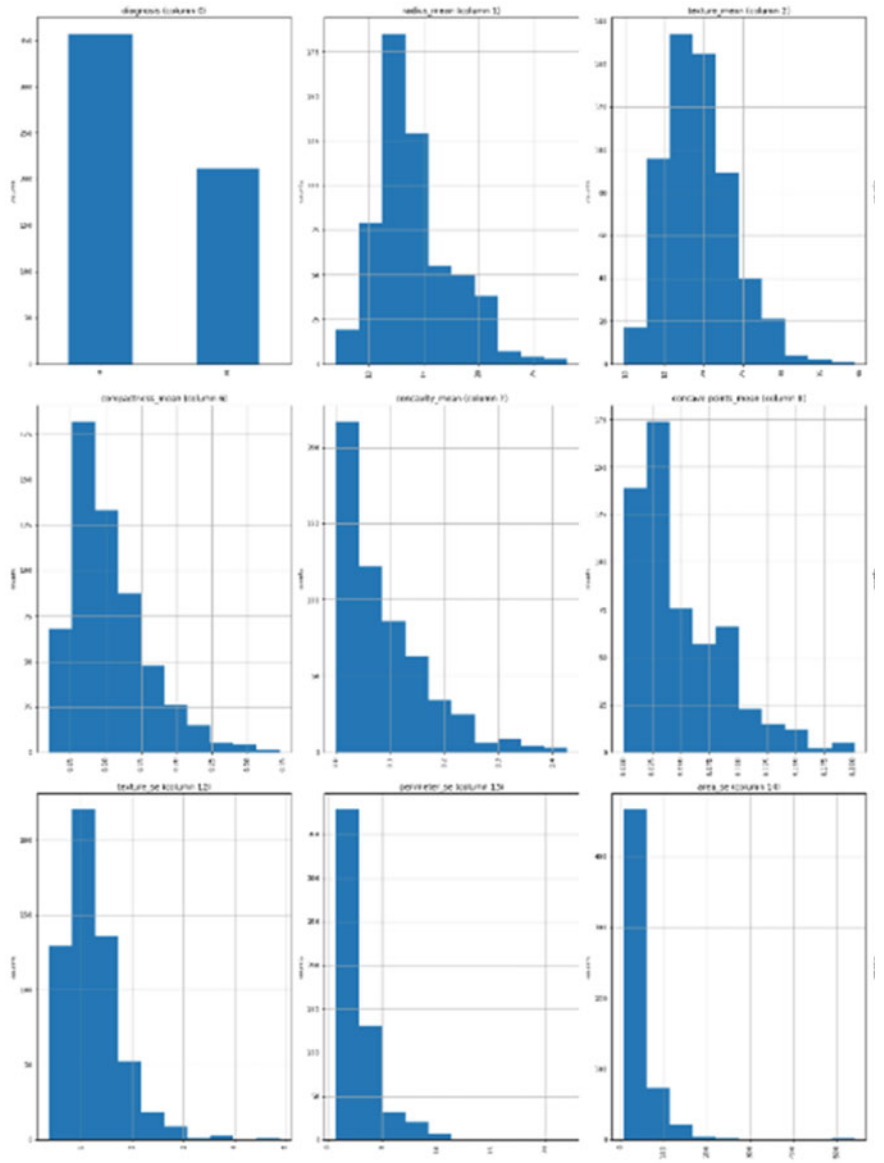

Fig. 1 Attribute histograms—first round

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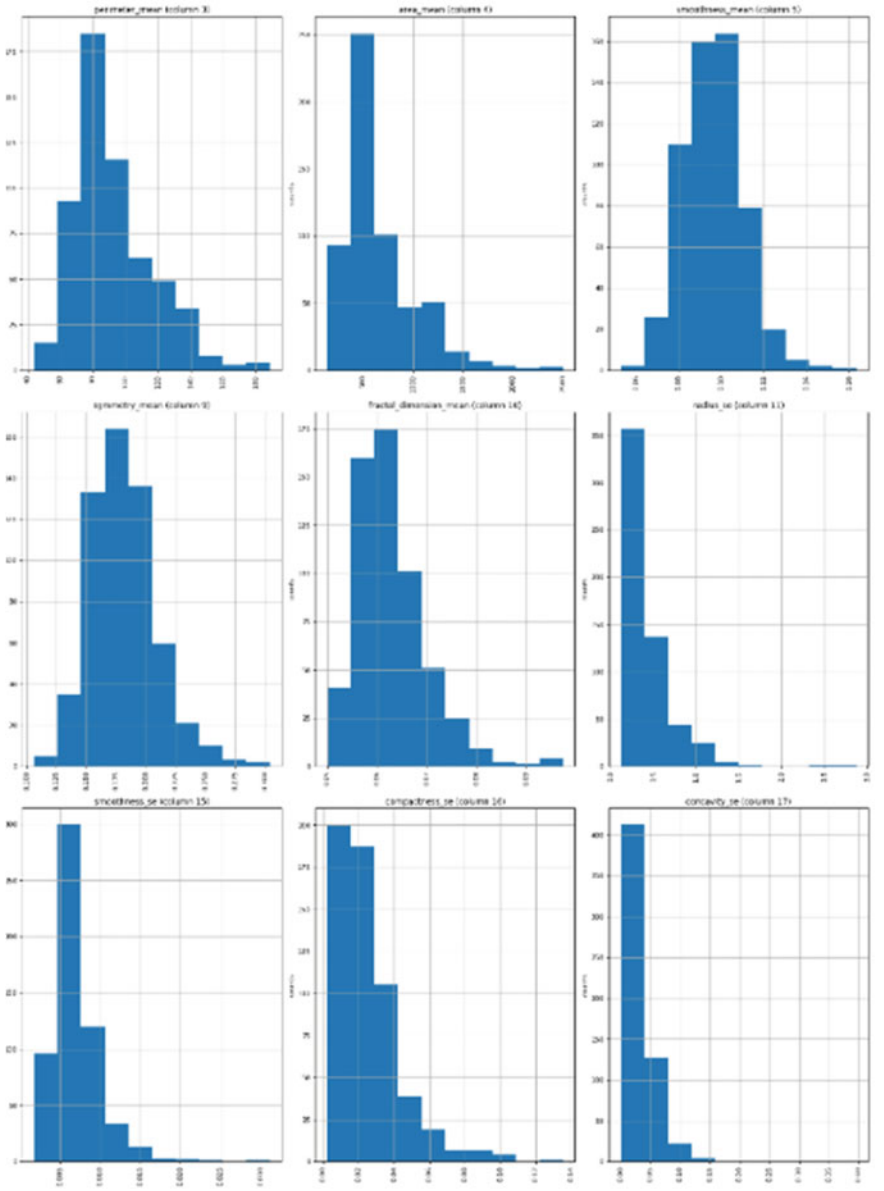

Fig. 2 Attribute histograms—second round

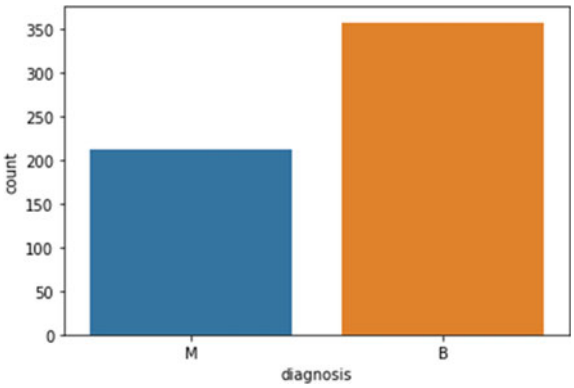

Fig. 3 Diagnosis class distribution

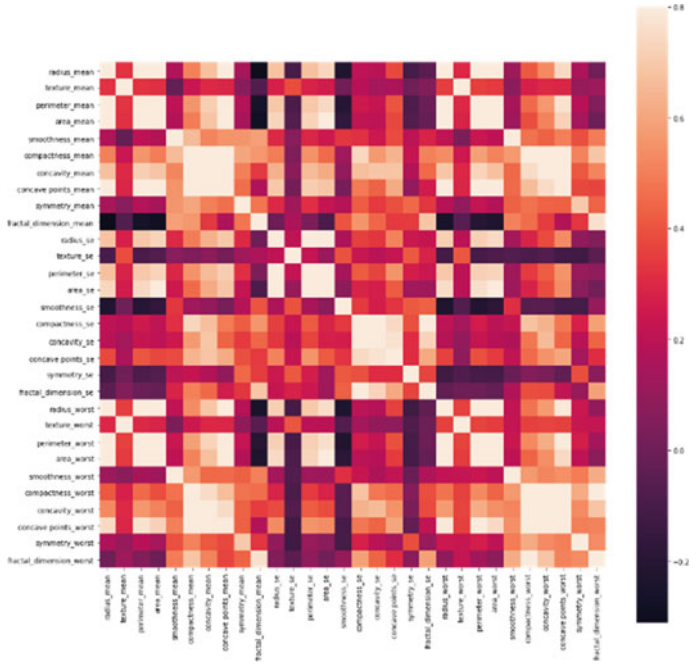

Fig. 4 Correlation map

accuracy			0.94	398
macro avg	0.94	0.93	0.94	398
weighted avg	0.94	0.94	0.94	398

Of 398 and 171 samples, the system predicted that there were M and B tumors, and of the 258 good tumor, the model predicted 16 as bad and similarly 7 of the

actual bad tumors were predicted as good. All correct guesses are located in the diagonal of the table, so it's easy to visually inspect the table for errors, as they will be represented by any non-zero values outside the diagonal (Farouk, 2021; Ghazal et al., 2021; Guergov & Radwan, 2021; Hamadneh et al., 2021; Hanaysha et al., 2021a, 2021b; Hejazi et al., 2021; Khamees et al., 2021a, 2021b). We define overall success rate (or accuracy) as a metric defining—what we got right—which is the ratio between the sum of the diagonal values (i.e., TP = (242 + 133)/398 = 94.2% and TN = 242/(242 + 7) = 97.2%) versus the sum of the table. Precision and Recall are accuracy metrics used by the information retrieval community; they are often used to characterize classifiers as well (Joghee et al., 2020; Kashif et al., 2021; Khan, 2021; Lee & Ahmed, 2021; Lee et al., 2022a, 2022b). The same is valid for the 171 records of testing which are shown in the following:

Accuracy on test set 0.9122807017543859

[[999]

[657]]

	precision	recall	f1-score	support
B	0.94	0.92	0.93	108
M	0.86	0.90	0.88	63
accuracy			0.91	171
macro avg	0.90	0.91	0.91	171
weighted avg	0.91	0.91	0.91	171

5 Conclusion

W Naïve Bayes has a best optimal runtime based on probability and mathematics with the advantage of being computationally inexpensive for real time (Al-Dmour & Teahan, 2005; Al-Dmour, 2016; Al Hamadi et al., 2017; Al Neaimi et al., 2020). The Naïve Bayes also attempts to model pairwise comparisons between different data classes based on conditional probability. We have used python framework through the following steps (Fig. 5).

It is mostly used when the observation sizes are continuous values (Mehmood, 2021; Mehmood et al., 2019; Miller, 2021; Mondol, 2021; Obaid, 2021; Radwan & Farouk, 2021; Shamout et al., 2022). The result showed model accuracy of 92 and 94% in testing and training dataset. The recall value was also 91 and 94%. Of 398 and 171 samples, 375 and 166 records were correctly classified.

We have analyzed the features through different literature articles which was often modelled in planar projected dimension and our analysis showed that the result of our methodology can be simpler with less computation costs in Python framework.

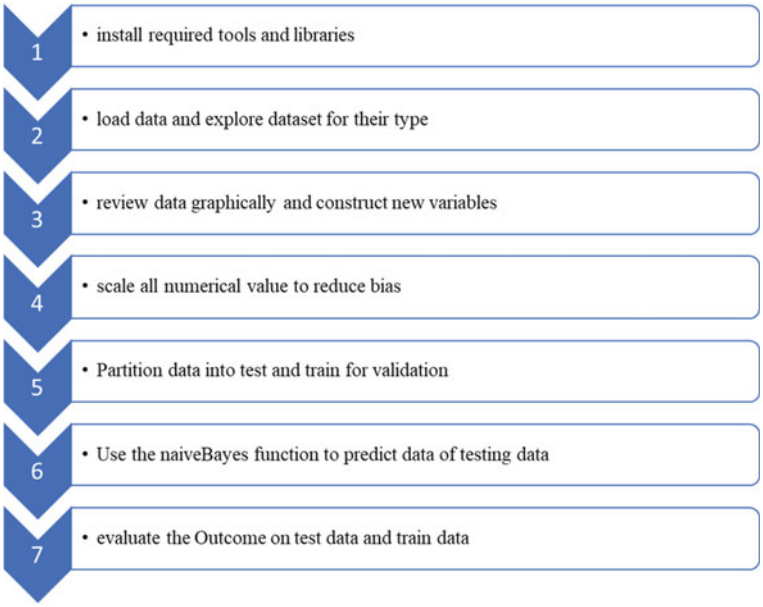

Fig. 5 Step by step python code

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Development of Data Mining Framework Cardiovascular Disease Prediction

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Abstract One of the highest shares of data-driven technology of health sector happens for private insurance stakeholders. It is therefore clear that private insurance companies can only survive being competitive in covering different medical stages such as surgery, intervention and other clinical trials in a high-risk environment. Estimation of expected costs and coverage is also important for both patient and insurer. In this case study we as a Data Mining and Artificial Business consultant want to explore different techniques of data mining to find out business risks for patients. We have asked the insurer to provide us a sizable medical history to watch those features. We would like to predict if given biographical profile of the patient along with exam results can predict CVD so he can cover his costs with this Insurer. On the other hand, in case of higher error of misclassified CVD what kind of decision should be taken by risk holder and insurer. Which one of these attributes

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_114

causing this cost and what other stakeholders like target group of patients can be suffered from the loss? The ultimate goal is to develop a model that can predict the gap between those patients' perception of their disease and their real disease. This can further help stakeholders to develop specific insurance policy.

Keywords Data science · CVD · Data mining · Disease prediction

1 Introduction

The smart healthcare is composed of multiple participants that include patients, doctors, research institutions, and hospitals (Akhtar et al., 2021; Al Ali, 2021; AlHamad et al., 2022; Alhamad et al., 2021; Ali et al., 2021, 2022). In essence, it is considered as an organic whole that involves various dimensions such as disease control and monitoring, diagnosis, treatment, health decision making, hospital management and medical research (Aburayya et al., 2020a, 2020b, 2020c; Alhashmi et al., 2020; Taryam et al., 2020). It is clear that Artificial Intelligence can be considered from Information marketplace perspective as well as IT governance among stakeholders. But Cardiovascular Disease (CVD) exceptionally has been paid more attention among others (Alnazer et al., 2017; Alnuaimi et al., 2021; Alsharari, 2021; Alshurideh et al., 2020, 2022; Alzoubi, 2021a). Linkage between CVD and other diseases are the subject of debate for instance look at how Cerebrovascular diseases being accompanied with mental impairment resulted in higher fatal rate. On the other hand, any patient suffering from CVD should experience extremely condition for his or her rest of life. What Data science as a framework can serve for this diagnosis of CVD is a kind of unstructured machine learning which can be best interpreted when is coupled with biography of the patient in features such as age, weight, physical activities etc. (Alzoubi, 2021b; Alzoubi & Ahmed, 2019; Alzoubi & Aziz, 2021; Alzoubi & Yanamandra, 2020; Alzoubi et al., 2020a, 2020b, 2021b, 2022) (Fig. 1).

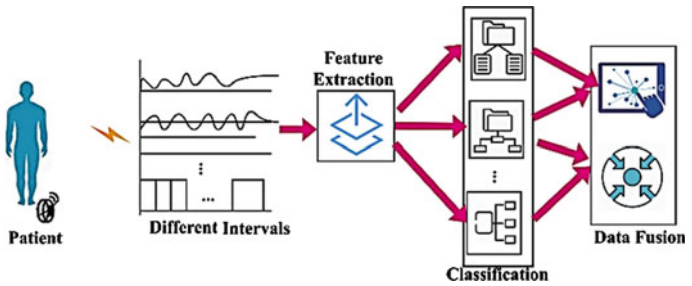

Fig. 1 Smart healthcare system

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2 Dataset Description

A. Preprocessing

The raw version of dataset originally consists of 70,000 records in 12 features patient biographical, medical exams and some information given by the patient like the smoking attitude etc. needed to implement with various data mining techniques in the IBM Modeler software (Aziz & Aftab, 2021; Cruz, 2021; Eli, 2021; Farouk, 2021; Ghazal et al., 2021b). Among the 12 columns of data, six of them were categorical, five numerical. The two remaining namely ID and age in days decided to be dropped out from the analysis which was filtered in source node of IBM SPSS. All data roles were set to Input except than presence of CVD as target. There was no missing or duplicated column in data. The numerical fields was checked for the outlier by comparing the range in boxplots of 3σ (95%). Gender, smoking, alcohol and physical activities as binary categorical data (Guergov & Radwan, 2021; Hamadneh et al., 2021; Hanaysha et al., 2021a, 2021b; Joghee et al., 2020). Furthermore, the cardinality of the Cholesterol and Glucose categorical data was transferred from well above normal, above normal and normal to 0, 1, 2. Here the model prediction power can be enhanced according to the label's value which is more favorable. In Fig. 2, the name and type of all variables plus target role presense or absense of cardiovascular disease can be observed (following figure).

In Fig. 3, the distribution and statistical representation of all variables observed (following figure).

Measurement unit of height is centimeter and weight is kg. Systolic blood pressure is the exerted pressure when blood is flowed in arteries (Kashif et al., 2021; Khan, 2021; Lee & Ahmed, 2021; Lee et al., 2022a, 2022b; Mehmood, 2021). Its normal value is 120 mmhg or below. Diastolic blood pressure is the measured pressure of blood between arteries and heartbeat with the normal value of 80 mmhg or below. The Cholesterol is a kind of fat measure which is ranged between 200 and 239 mg/dl. Glucose level is ranged from 100 to 140 mg/dl 8 h mg/dl hours before and 2 h after eating. For people without Diabetes is around 70–80 mg/dl (Fig. 4).

B. Bivariate Analysis

By univariate analysis we have observed that people older than 55 years are more suffered from CVD. We have also implemented the other categorical variables grouped by age which are shown in Fig. 5.

3 Methodology

Machine Learning of the selected dataset could semi-structured in in methods nature which can not only be perceived as clustering problem but also can be seen as a classification problem (Mehmood et al., 2019; Miller, 2021; Mondol, 2021; Obaid, 2021; Radwan & Farouk, 2021; Shamout et al., 2022). For initiating the modelling,

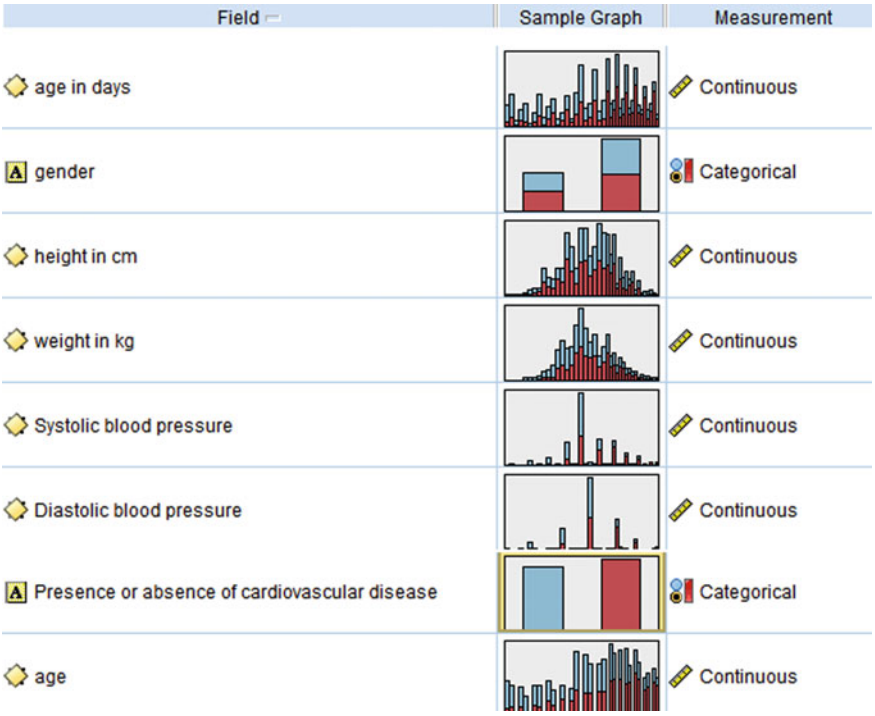


Fig. 2 Dataset fields

a feature selection was performed. The results of the feature selection are shown in Fig. 6.

4 Modelling

It is possible to derive more variable such BMI from our original dataset but because the coefficient of variation was far below threshold, we have selected only weight as the demonstration of the fat and glucose. By using the auto-classifier node we have set the baseline for model selection (Afifi et al., 2020; Al Batayneh et al., 2021; Ali et al., 2021; Alzoubi et al., 2021a; Ghazal, 2021; Ghazal et al., 2021a). The raw propensity with weighted voting Ensemble was selected between 9 different models. One advantage of this method was that exact feature could be defined by users. We have considered the selected features from the Fig. 6. On the other hand, the cut-off for calculation are outliers such as runtime, models accuracy and AUC configured to outrank when are below 50% (Ghazal et al., 2013; Ghazal et al., 2021c, 2021d; Kalra et al., 2020; Khan et al., 2021a, 2021b). This method is computationally cost effective ranking the models according to their number of features taken 3 min

Min	Max	Sum	Range	Mean	Mean Std. Err.	Std. Dev
14275	23713	1362850702	9438	19469.296	9.322	2466.411
--	--	--	--	--	--	--
140	188	11509355	48	164.419	0.029	7.718
32	117	5159050	85	73.701	0.050	13.214
76	177	8879851	101	126.855	0.063	16.581
51	111	5699522	60	81.422	0.035	9.328
--	--	--	--	--	--	--
39	64	3698930	25	52.842	0.026	6.764

Fig. 3 Statistical criteria

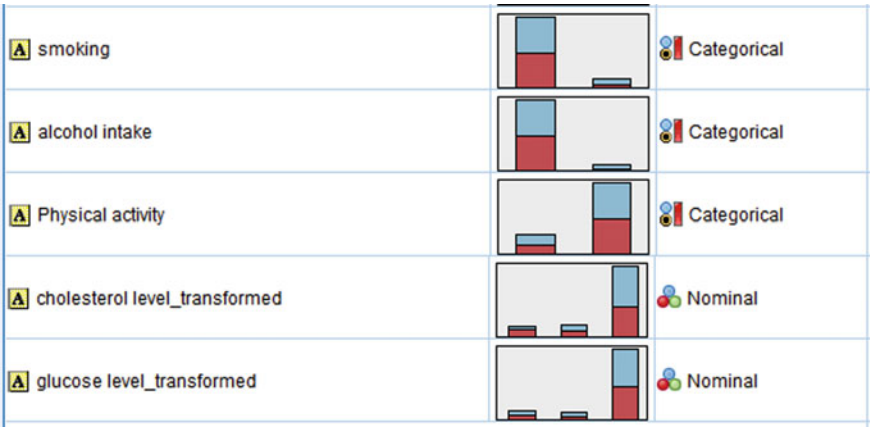


Fig. 4 Categorical variables

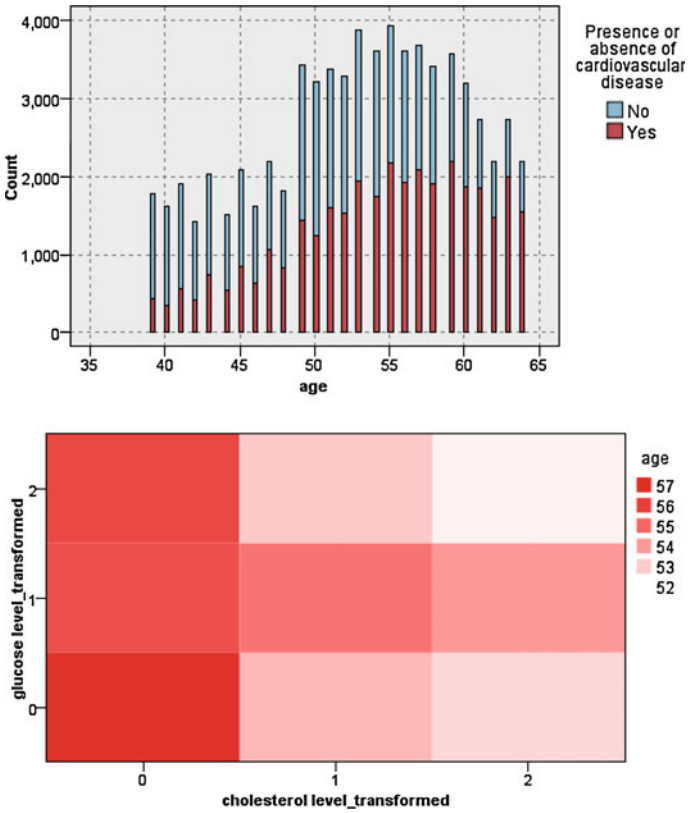


Fig. 5 Univariate and bivariate analysis

1	Systolic blood press...	Continuous	Import...	1.0
2	Diastolic blood pres...	Continuous	Import...	1.0
3	age	Continuous	Import...	1.0
4	cholesterol level_tra...	Nominal	Import...	1.0
5	weight in kg	Continuous	Import...	1.0
6	glucose level_transf...	Nominal	Import...	1.0
7	Physical activity	Flag	Import...	1.0
8	gender	Flag	Import...	0.968
	smoking	Flag	Single category too large	
	height in ...	Continuous	Coefficient of variation below thre...	
	alcohol i...	Flag	Single category too large	

Fig. 6 Feature selection ranking (vs. screened feature)

and 22 s to finish calculation on 9 different models. The feature importance with modelling accuracies is summarized in Fig. 7.

The last two models namely Decision List and Discrimination Analysis was our choice for modelling. Linear Discrimination Analysis (LDA) is the method used in Machine learning for the recognition of two or more objects (Khan et al., 2021a, 2021b; Lee et al., 2021; Matloob et al., 2021). In LDA, which is very similar to variance and regression analysis dependent variable is linearly relate to the other variables. The difference between these methods is that in LDA, instead of distance relationship, dependent variable is solved by the ranking or ordinal outranking. The LDA is also closely related to Principal Component Analysis (PCA) core component analysis. Because both methods look for a linear combination of variables that best describe the data (Naqvi et al., 2021; Rehman et al., 2021; Suleman et al., 2021). The LDA also attempts to model differences between different data classes. The

Graph	Model	Build Time (mins)	Max Profit	Max Profit Occurs in	Lift(Top 30...	Overall Accuracy	No. Fields Used	Area Under Curve
	C5 1	1	83918.188	47	1.672	74.013	11	0.789
	Logistic regr...	1	80,850.0	48	1.649	72.974	11	0.793
	Bayesian N...	1	79,782.903	46	1.668	72.756	11	0.793
	Discriminan...	1	76,548.0	46	1.627	71.913	5	0.782
	Decision Lis...	1	73,789.935	34	1.654	71.183	3	0.718

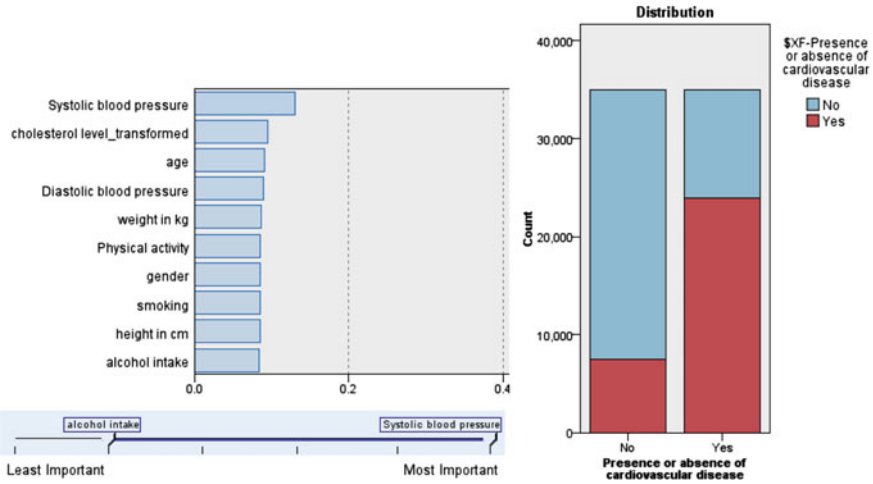


Fig. 7 Feature engineering

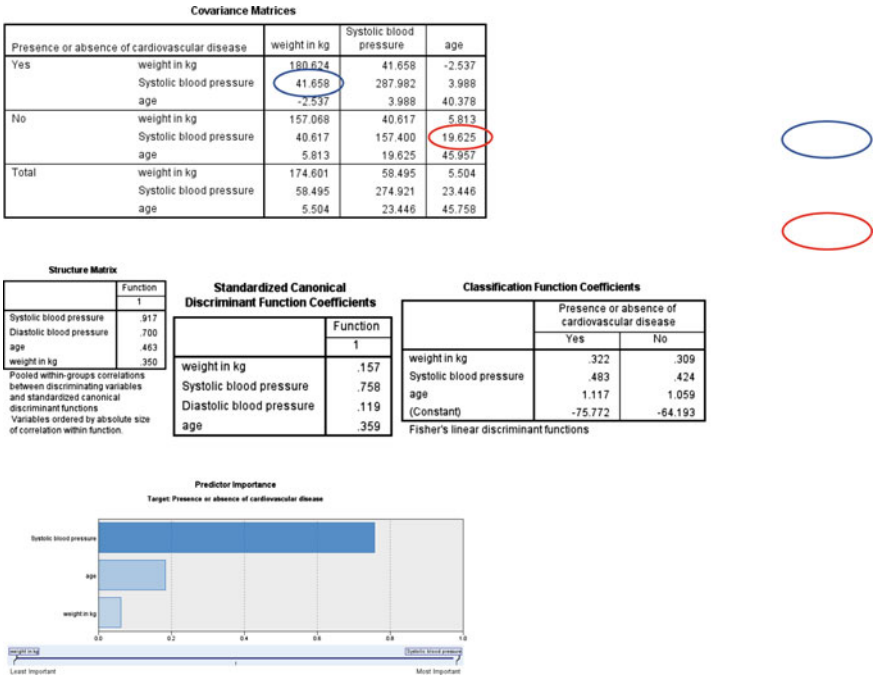
LDA is used when the observation sizes are continuous values. The other implemented algorithm was Decision List which is similar to decision tree. The method provides a set of classification rule that form an inherited order which make it easy for interpretation.

5 Results

The result of LDA was implemented for variable Systolic Blood Pressure fields. While no significant difference between Target grouping was observed in the covariance demonstrated for weight, the age parameter was significantly higher in No CVD patients (Fig. 8).

It should be noted that normal Value of Systolic Pressure is less than 120. This is related to age and weight according to the Discrimination function. The result of accuracy and confusion Matrix for the LDA analysis are shown in the following Fig. 9.

As can be seen in the above figure the more gain cannot be resulted by balancing the ratio of CVD to no CVD. The slight skewness between the cost of prediction FP and TP is on the basis of relationship between the Systolic Blood Pressure and



Covariance Matrices

Presence or absence of cardiovascular disease		weight in kg	Systolic blood pressure	age
Yes	weight in kg	180.624	41.658	-2.537
	Systolic blood pressure	41.658	287.982	3.988
	age	-2.537	3.988	40.378
No	weight in kg	157.068	40.617	5.813
	Systolic blood pressure	40.617	157.400	19.625
	age	5.813	19.625	45.957
Total	weight in kg	174.601	58.495	5.504
	Systolic blood pressure	58.495	274.921	23.446
	age	5.504	23.446	45.758

Structure Matrix

	Function 1
Systolic blood pressure	.917
Diastolic blood pressure	.700
age	.463
weight in kg	.350

Pooled within-groups correlations between discriminating variables and standardized canonical discriminant functions
Variables ordered by absolute size of correlation within function.

Standardized Canonical Discriminant Function Coefficients

	Function 1
weight in kg	.157
Systolic blood pressure	.758
Diastolic blood pressure	.119
age	.359

Classification Function Coefficients

	Presence or absence of cardiovascular disease	
	Yes	No
weight in kg	.322	.309
Systolic blood pressure	.483	.424
age	1.117	1.059
(Constant)	-75.772	-64.193

Fisher's linear discriminant functions

Fig. 8 Discrimination function centroids, coefficient and correlation

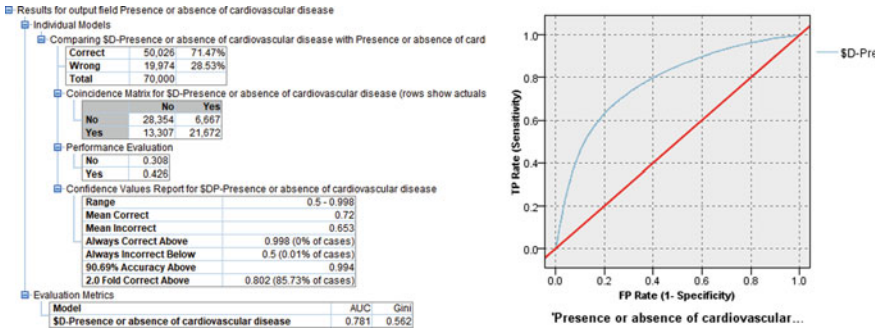


Fig. 9 Sensitivity versus specificity

Id	Segment Rules	Score	Cover (n)	Frequency	Probability
	All segments including Remainder		70,000	34,979	49.97%
1	**Diastolic blood pressure, Systolic blood pressure** Diastolic blood pressure > 80.000 and Systolic blood pressure > 150.000	Yes	4,452	3,857	86.64%
2	**Diastolic blood pressure, Systolic blood pressure** Diastolic blood pressure > 80.000 and Systolic blood pressure > 140.000 and Systolic blood pressure <= 150.000	Yes	4,002	3,430	85.71%
3	**Diastolic blood pressure, Systolic blood pressure** Diastolic blood pressure > 80.000 and Systolic blood pressure > 130.000 and Systolic blood pressure <= 140.000	Yes	7,117	5,807	81.59%
4	**Diastolic blood pressure, Systolic blood pressure** Diastolic blood pressure > 79.000 and Diastolic blood pressure <= 80.000 and Systolic blood pressure > 130.000	Yes	3,584	2,950	82.31%
5	**cholesterol level_transformed** cholesterol level_transformed = "0"	Yes	4,492	3,183	70.86%
	Remainder		46,353	15,752	33.98%

Fig. 10 Decision list result analysis

Age. This correlation happened just between weight and Systolic blood pressure and can also approved or further analyze in the decision list. We can see that with hypertension stages below reach the second stage of hypertension value of more than 150 and if it goes beyond 180 it forms a crisis (Fig. 10).

6 Discussion

In this case study we have implemented data analysis, we have checked all the variables for outliers, sharp variances. We have transferred two categorical variables namely Cholesterol and Glucose from categorical into ordinal. At the preprocessing stage performed univariate analysis and compare all distribution versus target groups. We have seen that between the selected fields three variables are not allowed to contribute to the modelling and outranked them. Then we have used 9 different modeling algorithm and watch the number of fields or set of fields that can resulted

in acceptable accuracy with lower costs. Out of two remaining algorithm one was accompanied with 3 and the other with two 4 fields. We have chosen those models into our stream file and perform the modeling. The result was with 71.4% accuracy and the best optimal condition is slightly skewed from the unbalanced target value.

The blood pressure and age of the persons can form a pattern for Insurer. Our results proved that the patients are more perceived with more than 25% of the cases and our solution for the patients is to observe other cases, testing or interventionist to make sure they are in danger of CVD. This effect can be compared with the Prospect theory and used for our problem insurer policies. In regard to the framing, reference point we have seen that patients are suffering from bad nutrition are in same danger as the people who already suffered from CVD when they are old and their weight increased.

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Unknown-Unknown Risk Mitigation Through AI: Case of Covid-19

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Abstract The purpose of this study is to investigate how artificial intelligence can mitigate unknown-unknown risks, taking COVID-19 as a case. The utilization of this technology has helped with the risk management and mitigations process by providing efficient solutions. Today, the artificial intelligence of applications plays a critical role in containing the fast spread of COVID-19 virus and reducing the number of infected individuals. This research will explore how countries around the world have benefited from contact tracing applications. The research discussed the UAE Alhosn application compared to the applications developed by China, Australia, Thailand, France, South Korea to identify the best features and better utilization of AI technology in the applications. In addition, a mixed-method approach used in this research, and a combination of a qualitative and a quantitative approach to make a clear understanding of the topic and find out accurate results. For qualitative research, interviews were conducted with five people from different companies in the UAE. For quantitative research, ten questions survey was sent to a sample of 50 random respondents who are the users of Alhosn application. Domain analysis was used to organize the ideas and to generate other ideas. The research will also gather secondary data based on reviews of literature related to the research topic. Based on the gathered information and research results recommendations were given.

Keywords AI · Covid-19 · Unknown risks · Risk mitigation · Project risk management

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_115

1 Introduction

With the fast spread of COVID-19 around the globe, many sectors got affected, such as economy, hospitalities, and tourism (Aljumah et al., 2021; Alshurideh et al., 2021). One of the main sectors is the health care; projects in this sector are focusing on minimizing chronic diseases and early prediction of dangerous conditions affecting people (Alshurideh et al., 2020, 2021a, 2021b; Lee et al., 2022a, 2022b). Artificial intelligence (AI) has played a significant role in performing business and governmental tasks. Many governments are leading in the utilization of applications to connect with the citizens (Alhashmi et al., 2020; AlShamsi et al., 2021; Alshurideh et al., 2022; Mehmood et al., 2019). Therefore, they have developed applications that use artificial intelligence to mitigate the unknown-unknown risk of the crises. Which will help to contain the fast spread of the virus and reduce the number of infected individuals (Alzoubi et al., 2021; Hanaysha et al., 2021a, 2021b).

Similarly, the UAE has launched Alhosn Application with a purpose to contain the spread factor. Those applications have emerged as great examples of the utilization of artificial intelligence for better health and life saving issues (Aburayya et al., 2020a, 2020b; Ali et al., 2022; Ghazal et al., 2021). For the reason of the high spread of the COVID-19, more than 500,000 people worldwide lost their lives. Governments around the world started to use artificial intelligence in order to mitigate the unknown-unknown risk of the crises (Ali et al., 2021; Alnazer et al., 2017; Obaid, 2021). So, they started to create applications for the reason of reducing the chances of people getting the virus (Alzoubi & Yanamandra, 2020; Alzoubi et al., 2020a, 2020b; Lee et al., 2022a, 2022b; Nuseir et al., 2021).

This research will study the impact of using artificial intelligence of applications in different countries, illustrating their features used to mitigate unknown-unknown risk of COVID-19. Emphasizing on Alhosn Application and provide recommendations for improvements.

2 Research Question and Hypotheses

Research Question

- How can we alleviate the known and unknown risks of COVID-19 by using the AI-based applications?

Hypotheses

- Artificial intelligence can mitigate unknown-unknown risks. COVID-19 as a case.

3 Literature Review

AI has been used by many organizations in different sectors to mitigate unknown-unknown risk (Alzoubi, 2021a; Guergov & Radwan, 2021; Khan, 2021). The purpose of this literature review is to evaluate and discuss how AI can help the health sector with mitigating the unknown-unknown risk through contact tracing applications. Many research papers and articles globally were reviewed to conduct the research.

Artificial intelligence is the science that allows machines to perform tasks that require human intelligence such as problem-solving, analyzing, speech recognition, etc. (Farouk, 2021; Mondol, 2021). Currently, AI is being used in different fields such as Human Resources, customer services, and banks for fraud detection (Alhamad et al., 2021; AlHamad et al., 2022; Alzoubi et al., 2022). However, organizations should understand that it's a double-edged weapon that has advantages and disadvantages (Alnuaimi et al., 2021; Alzoubi & Ahmed, 2019). One of the disadvantages is that it can be misused by attackers or hackers to expose the organization's data (Durbin, 2019).

There are many usages for the AI, one of them is that it is built in the applications as analytics tools (Hanaysha et al., 2021a, 2021b; Joghee et al., 2020). In the current case of COIVD-19, the AI was used in the applications to keep track of the infected people and analyze their input to mitigate the unknown-unknown risk of the rising numbers of the COVID-19 cases (Durbin, 2019).

Apple and Google announced a collaboration to slow the spread of the virus and accelerate going back to normal life (Akhtar et al., 2021; Cruz, 2021). Google stated that their initiative was to provide Application Programming Interfaces (APIs) to public health authorities around the world, which will allow them to trace the infected individuals and notify them to isolate themselves and take the necessary actions.

The applications are using Bluetooth and AI technology to operate (Aziz & Aftab, 2021; Mehmood, 2021). After downloading the application people are allowed to self-diagnose their health by feeding the application with their data. There are different uses for the AI in these applications; it has been used to analyze the data, and to protect the privacy of the users.

3.1 China

One of the successful implementations using the tracing Application was in China. Many tech companies developed different tracing applications to mitigate the unknown-unknown risk of the pandemic COVID-19. Jin et al. (2020) mentioned that 'the close contact detector' was added to the Chinese payment and social media applications in order to reach the largest number of people. These applications have a huge amount of user data that's been analyzed by AI technology (Alsharari, 2021; Eli, 2021; Lee & Ahmed, 2021). After downloading the applications, users have to add their details and scan a QR code to be able to enter or leave public

places and transportations. Based on the color code system, the application notifies all those who've been in contact with the infected individual in the last 14 days to quarantine themselves and to get tested (Jin et al., 2020).

3.2 Australia

Australia CovidSafe is another application that uses the contact tracing technology to contain the spread of COVID-19 (Al Ali, 2021; Miller, 2021; Radwan & Farouk, 2021). After downloading the application, the users have to add their personal information (name, age range, mobile number, postcode) in order to be identified by the health authorities. Australia health authorities stated that the application uses Bluetooth to send an encrypted code to all users. If an individual was tested positive, the infected person has to update the status in the application and give permission to the health authorities to alert those who have been in contact with him within 5 feet for more than 15 min during the past 21 days (COVID Safe application, 2020).

3.3 Thailand

To control the cases of COVID-19 in Thailand, an application called Thai Chana (Thai Victory) was developed by Thailand's Center for COVID-19 Situation Administration (CCSA) which was introduced to the public on 17/May/2020. The application has many features. Dr. Taweesin Visanuyothin, the spokesperson in CCSA mentioned that all businesses including street food vendors should be registered for the application online to get a QR code, these codes will be posted in front of their shops so that any customer will scan it before entering. The purpose of scanning the code is that people can be tracked and will be receiving warning messages if infected people had visited the same place. By this, the government will be able to track infected people with COVID-19 or the people who got close to them. Another feature of the application is that people can check wither the place that they are willing to visit crowded or not and wither they follow the control measures of COVID-19. Dr. Taweesin has also added that all users' privacy is protected and won't be shared with third-party, the only department that can access the information is the Disease Control Department (Huaxia, 2020).

3.4 France

StopCovid is the application that France established and design in order to trace and reduce the invasion of COVID-19 pandemic. The application designed on the contact tracing function which recognizes any person may contact an infected person,

this technology uses Bluetooth in the phones to trace any infected area or people that the user will contact. People who were diagnoses with coronavirus will have a special QR code to add it in the application, then the application stores this code in other people's devices to alert them if they are within one meter of the infected person (Wikipedia, 2022). The application was established on the 8th of April, as per TechCrunch, electronic news web site, their government hosted a press conference once the appl has been release to share the statistical analyses of the app. After three weeks of the release, 1.9 million users have downloaded the application from both stores and most of them activated it. However, most of the French population uninstalled it as they feel it won't help them, for many reasons. The majority of them see that the government will not have any record about the people as the application does not ask you to register your name, another reason that the application does not cover all European countries. France's digital minister Cédric O said. "If I have one regret it's obviously that it isn't compatible with other European countries." Moreover, the QR code should be entered manually in the application, which affected the accuracy of the application, this was a reason for them not to trust the application, however, Mr. Cédric O stated that the application will keep improving for better features and functions (Dillet, 2020).

3.5 South Korea

South Korea is considered to be a model since it did not take its citizens through a lockdown as in most of the countries. Moreover, there are fewer new cases in South Korea, with 244 reported deaths in three months since a sudden occurrence of a virus was announced in the country. This was achieved due to the good underlying basis of the country's coronavirus response with thorough testing mechanisms, which is backed by the countrywide contact tracers' network who dialogue with the infected people, followed by tracing their contacts. The technique involves the use of mobile phone alerts, though the Bluetooth applications are not used at the moment (Whitelaw et al., 2020). Thus, it is essential to be noted that the application "Corona 100 m" is based on the degree of surveillance that citizens of most of the countries do not find it easy to agree with.

Through this app, in case, an individual test positive for coronavirus, a text alert is sent to all the neighbors of the infected person who came in contact with him within 100 m, which is followed by contact tracing to curb the spread of the virus (Whitelaw et al., 2020). The alert text includes a link having many of the movements log of the infected people, and the neighbors are notified after every one minute. Moreover, these movements are traced from public data like television cameras' closed circuits. The results of the contact tracing are enhanced by the fact that the government of South Korean is permitted to access private records of people, such as the transactions of the credit-card (Whitelaw et al., 2020). Moreover, the most important segment of this application is that the movements of the people are published and anonymized online to ensure that the government's coronavirus guidelines are followed through

supervision. The developer says the application is very successful reaching 20,000 downloads per hour. Therefore, the use of this application has led to quick and accurate contact tracing in South Korea leading to a low number of new cases and deaths from the virus on the global map (Alzoubi, 2021b; Hamadneh et al., 2021; Kashif et al., 2021).

3.6 Alhosn UAE

During this challenging time, UAE launched an application named Alhosn UAE to contain the spread of the virus. The application was developed by the National Emergency Crisis and Disaster Management Authority in collaboration with the Ministry of Health and Prevention and local Health Authorities (Alzoubi & Aziz, 2021; Alzoubi et al., 2020a, 2020b). The application depends on Bluetooth technology, AI and QR codes in order to operate. The two main functions of the applications are; to provide quick access to test results, track people movement and inform those who contacted an infected case about their current health states (Emirates News Agency-WAM, 2020b).

The users can register in the Application using their Emirates ID and phone number; each user will have a unique QR code that follows a color-coding system that indicates users' health states. Those codes might be used in the future to grant access to public places (Alhosan UAE App, 2022).

Abdul Rahman Al Owais Minister of Health and Prevention stresses on the importance of collective efforts all segments of society citizens and residents from all nationalities in the process of containing the rapid spread of the virus. The government encouraged everyone to download the application by making it available in three languages at both Apple Store and Google Play for free to stand united against the pandemic (Emirates News Agency-WAM, 2020a).

Everyone in the country should have an account; thus, the developers took into consideration the individuals who are not using phones such as children, elderly, and People of Determination. They can be added to one of the family member's account or the care provider's account (Alhosan UAE App, 2022).

4 Research Methods

To evaluate how artificial intelligence can mitigate the unknown-unknown risk-taking COVID-19 as a case, a study was applied to several risk executives and IT employees across the UAE. A combination of both qualitative and quantitative approaches was used to conduct the study since each one of them has its weakness and strength. The mixture between the methods allows us to get accurate results from the quantitative questionnaire and unpredictable answers from the qualitative interviews.

Five interviews were conducted from 5 different organizations around the UAE, interviewing risk management experts and IT executives. Questions were in a qualitative approach, which gave us the chance to interact with the interviewees directly. It also allowed us to understand their perceptions and opinions in a clear way.

To get more accurate analysis and results about the artificial intelligence and especially about the Alhosn application, a quantitative survey of 10 questions was distributed in a random sample among the seven Emirates on 50 people who are using Al Hosn app. This method helped us to get a fast analysis and data collection. The quantitative method of search is the best way to get exact statistics that can be compared easily.

To analyze the results of the questionnaire, the research used the domain analysis which is the best way to come with new and different ideas and then organize them. It also categorizes each idea to the one related to it. However, a narrative analysis was used to conduct the interviews which allowed us to analyze the results and observe them.

5 Results

5.1 Interviews

Through the interviews, it was clear that risks are different from one organization to another, in our research we had the chance to interview five employees from different organizations: Ministry of Community Development (MOCD), Khalifa Fund for Enterprise Development (KFED), Sharjah Documentation and Archives Authority (SDAA), Abu Dhabi Islamic Bank (ADIB), and Sharjah Girl Guides (SGG).

Our interviewer Mr. Saeed from MOCD said that "risk is divided into many categories starting from enterprise risks and breaking into IT, cybersecurity, operations, financial risks, legal liabilities, accidents, and natural disasters." Moreover, information lost and damage of documents duo to viruses or natural disasters is the main risk in SDAA as per Mr. Taryam.

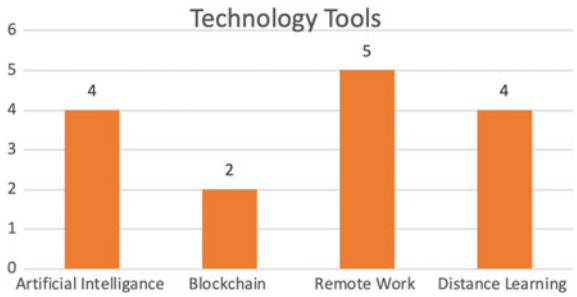
Moreover, Mr. Loay Mahmoud from KFED stated that "the risk in the organization is low in severity, as the health risk and the financial risk is very minimum". Also, the interviewee Mr. Francies, IT manager, said: "There are some potential risks that could occur in SGG and have a negative impact and influence, such as operational risks, safety-related risks, work environment risks, natural disasters, financial risks, staff, and members related risks." The last interview was with Mr. Jaber Ali, Branch manager in ADIB stated that as a financial institution they have a variety of risks such as embezzlement, information leaking, and scammers.

All organizations have strategies and methodologies in dealing with risk, therefore all of our interviewees agreed that they deal with the unknown risk by planning, setting policies, and procedures. For example, ADIB has a risk department that includes employees who are experts in risk management, they hold a

monthly meeting to discuss all the risks in the bank and might have emergency meetings in case of any risky situation.

Some of the interviewees mentioned that they are using and following defense-in-depth, risk-based, and business continuity policy approaches since they standardize the needed actions, resources, and crisis management communications during the unknown risk period.

Moreover, Mr. Francis said that their methodology is to find the root cause of the problems, look at the impact of each risk and the probability. Then, use that information to prioritize risks and come up with solutions as a response.



The organizations use several technology tools in the risk process, based on our interviews, all of them agreed on remote working, 4 out of 5 of the chosen organization uses AI and Distance learning, and 2 uses the blockchain.

ADIB uses AI to protect its customer's accounts form the risk of scammers as Mr. Jaber stated in his interview. They adopted the one-time password in any financial transaction that happens through their digital channels. Moreover, Mr. Saeed said that they use AI to implement risk responses, monitor and identify risk, and qualitative and quantitative analysis. Also, his organization uses AI to identify malicious codes and doing incident response in MOCD.

Remote working is another tool that been used by all mentioned organizations to mitigate the risk of COVID-19. Mr. Taryam illustrated that his organization can't stop working during the lockdown and their experience was successful. He added that the authority provided all the supporting applications and programs that mitigated the unknown-unknown risk, giving an example of that; they replaced the internal SharePoint by external SharePoint to ensure the employee's access to the needed information from home.

Similarly, ADIB head quarter replaced the employee's PCs with laptops with the required systems and applications ensuring the business continuity with a high level of security when working remotely to prevent the leaking of financial information.

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5.2 Interview—AlHosn Application

Our primary data shows that it was not mandatory to download Alhosn application in 80% of the organizations. However, ADIB management stressed on the importance of downloading the application. On the other hand, Mr. Loay and Mr. Francis stated that all their employees must download the application as it Identifies any COVID-19 positive cases and regularly checks the employees' health status.

Most of the candidates suggested new features to be added to the application. Tracking other infected people without leaving the application open all the time which affects the battery life and the data as per Mr. Taryam. Mr. Loay and Mr. Jaber suggested keeping a record of recommended safe areas such as shopping malls and groceries as well as a history of the visited places. Also, Mr. Francis suggested linking the application to Human Resources in the organization to alert them for any infected cases.

Three of our interviewees think that China developed the most powerful and effective application, as it's mandatory to download the application that helped to decrease the spared of the virus. A security feature in the application needs to be improved as it keeps a record of personal information and the visited places. Mr. Taryam stated that a third party might use this information for advertising purposes.

6 Survey

The survey targeted 50 individuals based on their age and location. The majority of them were aged between 20 and 40, 50% of them were between 20 and 30 years old, and 28% were between 31 and 40. Among the 50 candidates, 12 of them are located in Sharjah, 10 in Dubai, 4 in Abu Dhabi, and the rest are from the other Emirates.

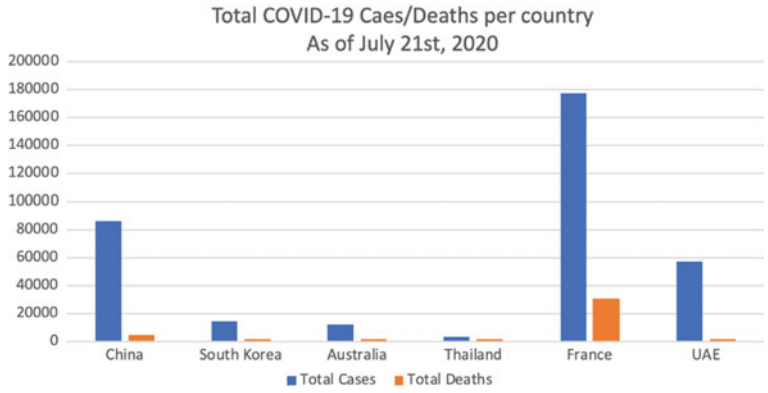
Questions 3 and 4 were based on the scaling from 1 to 5 as of 1 is least, 5 is most. 70% of them trust that the application can mitigate the risk of COVID-19 as they chose 5 from the scale. Moreover, 30–40% will likely recommend downloading the application to other people. The survey questions were followed by yes and no question, 70% of the candidates was not obligatory in their work or organization to download the application. Also, about the personal information in Alhosn's application, 80% of them find that their information is not safe and might be exposed. Moreover, the features in the application were satisfying for 60% of the users. Besides, all of the 50 candidates think that the application needs to be improved to mitigate the risk of COVID-19.

The candidate used Alhosn application in many places such as supermarkets, work, and closed shopping malls. Moreover, most of them voted for other countries' applications for the best application in their opinion, Thailand got 15 votes, China 12 votes, KSA 10 votes, Alhosn 3 votes, Qatar 2 vote and google 10 votes.

7 Discussion

It is evident that, the type and intensity of risks vary from one organization to another. Unknown -Unknown risks are the most critical of them all as they are usually unexpected an unplanned for. COVID-19 has changed all previous assumptions, the pandemic has proved the importance of having a Risk Unit at every organization, and it has also revealed which organizations have strong Risk Assessment and Business Continuity plans compared to those who failed to catch up with the others.

As we are in 2020, it is important to highlight the methods used to address risks have improved a lot. AI is a major tool used in many organizations to address risks such as COVID-19. As our research has proved the use of AI mainly through advanced tracking mobile applications by the governments of the countries illustrated in the literature review that helped control the spread of COVID-19. There is an evident link between the efficiency of the AI tools used and the number of cases and deaths in the country compared to the overall calculation. On the other hand, one example in our research, France, had a less impactful AI application which the public didn't trust, didn't download and the impact is disastrous as shown in the cases/deaths in the diagram below (Wikipedia, 2022).



Taking UAE as a case, our interview and survey results show unlike the countries that made it mandatory, it is still not mandatory to download Alhosn Application at many organizations (80% of the interviewees and 70% of the individuals surveyed). Also, the interviewees stated that even if it is downloaded, unfortunately, many of them don't activate it as it consumes their battery-life. On the other hand, most of them agree on the effectiveness of this application in controlling the pandemic in the country and worldwide.

8 Conclusion

In conclusion, risk assessment is a critical exercise that is conducted in most organizations. COVID-19 is one of the most critical risks in this century, if not the most critical of them all in both severity and coverage. The pandemic affected every country worldwide in all sectors mainly health and economy (Alameeri et al., 2021; Amarneh et al., 2021; Harahsheh et al., 2021; Leo et al., 2021; Shah et al., 2021). As our literature review showed the success of governments in controlling COVID-19 relies on the use of AI methods. Countries that have successfully launched advanced AI methods through mobile apps, access to analytical data, and linking it to the use of physical detectors have proved to control the pandemic with fewer cases of disease and fewer deaths. Our recommendation is to make Al Hosn Application in the UAE mandatory for citizens and residents to access public places. This will give the government a lot of insights on where the infected individuals have been and who they have encountered. Another recommendation is to increase the efficiency of the application by minimizing its battery usage. Finally, the Application can share the list of recommended or safe areas that implement all the precautionary measures to the users.

Appendix 1

1. Was it mandatory to download Alhosn App to resume the office work in your organization?
.....
.....
2. If yes, how did Alhosn App helped with mitigating the risk in your organization?
.....
.....
3. What feature can be added to the app in order to help the organization to mitigate the unknown un known risk?
.....
.....
4. In your point of view, which country developed the most powerful artificial intelligence app to face covid-19? Why?
.....
.....
5. In your opinion, dose this App have a threat on people privacy?
.....
.....

Appendix 2

Questionnaire to Evaluate the effectiveness of Alhosn app

This questionnaire is made for the purpose of evaluating Alhosn app which is an Artificial intelligence tool which is an app to track infected people with Covis-19 and how its impact on people in different areas in the UAE

Candidate Information

Name:

1- Age

20 to 30 years ☐

31 to 40 years ☐

41 to 50 years ☐

Over 51 ☐

2- Residential Area

Abu Dhabi ☐

Dubai ☐

Sharjah ☐

Ajman ☐

Um Al Quwain ☐

Al Fujairah ☐

Ras Al Khaimah ☐

Al Hosn App Inquirations

In the scale of 5 choose the most appropriate answer [1 is least, 5 is most]

3- Trust that app can mitigate the risk of Covid-19

1	2	3	4	5
☐	☐	☐	☐	☐

4- How likely do you recommend others to download the app

1	2	3	4	5
☐	☐	☐	☐	☐

In your point of view answer by yes/no

5- Was it a mandatory to download the app in your institution or work?
Yes ☐ No ☐

6- Personal information in Al hosn app can be exposed by third party
Yes ☐ No ☐

7- Are the app feature satisfying?
Yes ☐ No ☐

8- Do you think that the app can be improved which will have more impact in mitigating the risk of covid 19?
Yes ☐ No ☐

9- Where do you use Al Hosn app in order to protect you from being infected from the covid-19? (you can choose more than one choice)
Work ☐
Closed shopping malls ☐
Open areas of shopping ☐
Gym ☐
Beauty Spa ☐
Supermarkets ☐
Other ☐
[Specify] _____

10- Which from the following apps you think has the best features?
Thailand app ☐
China app ☐
UAE Al hosn app ☐
Qatar app ☐
KSA app ☐
Australia app ☐
Other ☐
[Specify] _____

Thank you for your feedback!

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Covid19 Unknown Risks—Using AI for Disaster Recovery

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Abstract Artificial intelligence (AI) is a potentially powerful tool to mitigate the unknown unknown risk. Unknown-Unknown risks are unknown risks and accordingly unknown consequences. This research's objective is investigating the impact of AI on mitigating unknown unknown risk. For all six cases analyzed, it was possible to extract that unknown risk is hard to be reported in advance. Therefore, since the outbreak of the Coronavirus COVID-19, organizations have been eager to use AI in response to the consequences caused by this pandemic. As a result, AI played a significant role in rapid response, decision-making, early prediction, automated processes, and detection and tracking. This means AI has the potential to be used as a solution to mitigate the post event impacts and study the patterns for future prediction.

Keywords Artificial Intelligence · Machine Learning · Unknown risks · Uncertainty · Coronavirus · COVID-19

1 Introduction

Risk management is the guide to protect against any uncertainty and risk. The concept of 'unknown-unknown risk', which is the lack of awareness of the existence of a risk

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_116

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that in itself is unfamiliar, has gained increasing attention in recent years, especially with the emerging crisis such as the Fukushima nuclear disaster. In many cases, the unknown unknown risk disturbed businesses, people, and caused huge losses.

Over last few months, as coronavirus spread across the world, countries are trying to learn about the COVID-19 to figure out how to slowdown the spread of the virus and defeat it (Akour et al., 2021; Alshurideh et al., 2021a, 2021b). It has been very difficult for business and health care systems to plan for the impact of COVID-19 due to the lack of historical comparisons of such outbreaks of this level and severity (Alshurideh et al., 2021a, 2021b; Hamadneh et al., 2021; Harahsheh et al., 2021). Countries struggled to act against this event due to the unknown nature of it and its consequence, which led many to follow the containment method to limit the spread of this virus and be able to focus on finding better solutions to react (Guergov & Radwan, 2021; Nuseir et al., 2021; Obaid, 2021; Taryam et al., 2020). Many new strategies were followed to decrease the impact of the unknown risk of this event such as school closure, traveling limitations, work from home, etc. (Ahmad et al., 2021a, 2021b; Aljumah et al., 2021). However, some of these strategies resulted in long-term damage to the economy due to the uncertainty of the shape of this virus during each stage and how to deal with it, which put a lot of stress on the healthcare system (Aburayya et al., 2020a, 2020b, 2020c; Cruz, 2021; Khan, 2021). In response to this risk, science and technologies have been working together to contain the negative consequences and reduce the losses for businesses and economies.

Allowing the potential of AI application in reacting against unknown unknown risk can be an opportunity to mitigate the impact of such risk (Al AlShamsi et al., 2021; Shebli et al., 2021; Yousuf et al., 2021). What makes it a good solution is the ability to increase in computing processing power, the rise of big data, and the adoption of cloud computing (Ali et al., 2022; Alzoubi et al., 2022; Mehmood, 2021). In addition, AI can adapt ambiguous or contradictory messages through visual perception, decision-making, and speech recognition as well as translating between languages (Hejazi et al., 2021; Khamees et al., 2021; Naqvi et al., 2021). AI is coming across as one of the main technologies that are accelerating the decision-making process based on real time insights.

2 Research Problem

Many papers were published regarding unknown unknown risk and how to deal and overcome the challenges posed by this type of risk. Unknown unknown risk is a type of risk that can be considered as an extremely dangerous risk because its possibility and consequences are undetermined. The danger of unknown unknown risk is that since it is unpredictable and no one is aware of it, it cannot be managed at its initial appearance that in some cases leads to disaster or organization bankruptcy and massive losses (Alshurideh et al., 2022; Shah et al., 2020, 2021). Therefore, this research will aim to study the ambiguity of managing and acting towards the unknown risk. Specifically, it will examine the contribution of AI in mitigating the

unknown risk and the management of change when this risk occurs. The capability of this technology can play a significant role in lowering the chances of negative consequences. This study will be based on the COVID-19 pandemic. It has been chosen because it illustrated the importance of technology in allowing life and businesses to continue as usual under such circumstances.

This paper will be divided into five sections. Firstly, the introduction, followed by a literature review addressing the unknown unknown risk, and Artificial Intelligence. The third section will gather data from secondary sources about different uses of AI in combating unknown unknown risk and COVID-19 will be a case study. The fourth section will perform a qualitative and quantitative analysis for these case studies, and based on the outcome, it will answer the hypothesis of this paper and present the effectiveness of this technology in mitigating unknown unknown risk.

3 Literature Review

3.1 The Need for Technology-Based Solution

Typically, once a disease or biological disaster becomes a reality, humans and human contact will aid its transmission and become the main element for spreading and aggravating infections and deaths caused by the disease or disaster (Hanaysha et al., 2021a, 2021b). A typical example is the case of the ongoing COVID-19 pandemic. COVID-19 is a looming but avoidable catastrophe. During the COVID-19 pandemic, the potential to control and contain the pandemic and its consequences using human elements have been critically undermined and also led to infected health care professionals (Blumenthal et al., 2020; Cabarkapa et al., 2020; Pietsch, 2020). Considering the potential human and economic consequences disaster could have, immediate actions must be taken to effectively monitor, manage, and recover disasters. Instead of relying solely on overstretched healthcare professionals and government officials, it is important to seek a better and risk-free solution to prevent and control disaster (Alshurideh, 2014; Aburayya et al., 2020a, 2020b, 2020c). This, therefore, necessitated the need for a technology-based solution to address these crises.

One justification for the technology-based solution is that it is not highly reliant on physical interactions (Hanaysha et al., 2021a, 2021b; Lee & Ahmed, 2021). That is, it requires limited human interaction and resources as it is able to operate with little or no human input, it is immune to infectious diseases, and it can function effectively in infected environments (Alsharari, 2021). More so, a technology-based solution is less vulnerable to human-related issues like stress, mental health burdens, physical fatigue, and other health challenges that frontline health workers may encounter during unknown risks and disaster recovery.

3.2 Unknown Unknown Risks

An unknown unknown can be defined as the state of being unaware that a particular risk exists. The repetitive unknown unknown is not a word mistake; it refers to unknown likelihood and unknown impact. Another research defined it as events considered to be impossible to find or imagine in advance (Kim, 2012). Many researchers have explored how to understand the unknown unknown, but the challenge exists in the nature of the event. In some research, they related the unknown unknown risk to the black swan theory, which is an unpredictable event that is beyond what is normally expected of a situation and has potentially severe consequences (Nafday, 2009). This term came from an ancient saying that presumed black swans did not exist and it was developed by Nassim Nicholas (Nafday, 2009). This is because both share the condition of having a major impact, extreme infrequency, and the widespread insistence (Alzoubi, 2021a; Lee et al., 2022a, 2022b). It is described by some as an outlier because it lies outside the realm of regular expectation, since nothing in the past can predict its possibility (Hajikazemi et al., 2016).

Sometimes, problems exist in people rather than the event itself and the major obstacle to address this type of event is the lack of capability to accept it, and people who cannot cope with unknown unknown will sometimes actively ignore it (Alles, 2009). Another challenge is to turn as many unknown unknowns to known known and being proactive in being exploring organizational environment (Eli, 2021; Miller, 2021). Not all possibilities can be thought of and planned, but there are ways to minimize delays and negative impact caused by unknown unknowns. The biggest takeaway is to become better equipped at identifying, predicting, and managing the risks related to these occurrences (AlHamad et al., 2022; Lee et al., 2022a, 2022b).

Despite that risk management performs as forward looking, it is not possible to identify all risks in advance (Hillson, 2016). Unknown Risk cannot be managed proactively and usually in unknown risk events, a workaround approach is used to respond to unidentified risk. The approach is based on planning once the unknown risk occurs and managing it. It is hard to predict it, but possible to manage and minimize its negative impact once it has happened.

3.3 The Need for Advanced Technology

In a bid to effectively predict, control, manage, and contain biological disasters like COVID-19, which are occurrences that are difficult to detect preemptively but have a high negative impact, advanced technology is needed. Although several emerging technologies have been revealed to show potency for disaster recovery (Jia, 2019), an advanced technology-based solution that is more promising is AI (Artificial Intelligence) technology.

3.4 Artificial Intelligence and Machine Learning

AI, as we know it, is the short form of Artificial Intelligence. This is where the science and technology come to play, with multiple approaches, on where the advancement of science creates a paradigm of virtue for every sector in any industry to succeed (Zhang et al., 2019). The famous mathematician Alan Turing, changed the world forever by asking a simple question and that is, 'Can Machines Think'? With in-depth research, he was able to prove the main and fundamental goal of artificial intelligence. AI was created for a reason and that is basically to replicate the human intelligence in a machine (Graham-Cumming, 2012). In simple words, AI can be defined as the simulation of human intelligence in machines that are programmed to think like humans and mimic their activities (Al Ali, 2021; Mondol, 2021; Radwan & Farouk, 2021). This term can also be used for any machine that demonstrates characters associated with a human mind such as learning and problem solving.

Moreover, Machine Learning (ML) is a subdivision of AI and refers to the study of computer algorithms that allow computer programs to automatically improve through experience (Lord et al., 2009). It is one of the ways to achieve AI and functions on small to large datasets by inspecting and correlating between the data to find common pattern. It is very important to understand how to choose the correct algorithm type and its logistic progression in order to get a correct output and avoid any bias affecting the application. Several researchers found that using correct algorithms and tools can help in dealing with uncertainty projects and complex environments better. In addition, they believed that AI as a tool is better and more accurate than traditional tools (Martínez & Fernández-Rodríguez, 2015).

AI was created for the entire basis and the future of all complex decision making and it has been extremely efficient with its evolution of machine learning. There are several types of AI where machines are being taught and knowledge is learned (Alzoubi, 2021b). Machines are given the opportunities to analyze and learn data just like the human brain (Motoda & Yoshida, 1998). With technology as advanced as this, there has been significant progress in manufacturing, finance, healthcare and even retail, all with the help of artificial intelligence (Zhang et al., 2019).

3.5 Why AI is Trending Now?

Over the past decades, the field of AI has made great progress toward computerizing human reasoning and its breakthrough in a wide diversity of sectors from healthcare to transportation. AI techniques are used by many industries through exploiting data and optimizing business and production processes. It processes the data in ways that are more dynamic and create value with faster and more accurate decision that result in reduced operational costs and personalized customer experience (Ferma, 2019). In addition, ML is assisting financial services companies with advanced fraud detection, and computer vision is optimizing offline retail. AI can assist with an

unbroken supply chain and boost productivity. Artificial intelligence is not only known to improve lives but has managed to save lives as well. AI has assisted with creating personalized drug protocols for a better diagnosis, with robots even assisting in surgeries (He, 2019). AI is helping the humankind to save the world by creating smart agriculture with efforts to solve global challenges (Motoda & Yoshida, 1998).

3.6 AI in Risk

AI is recognized for its potential in many fields including risk management. We can see that ML and AI are playing an important role in enhancing the risk management processes. Companies like oracle uses AI to conduct enterprise risk assessment through identifying risk material in the organization by calculating inherent risk using likelihood, impact, and analysis model (Folsom, 2020). Microsoft is another example that utilize AI to identify the root cause of risk occurrence and perform qualify analysis in earlier phases of risk management process (Microsoft, 2020). However, the level of implementation varies between the organizations, but it is clear that companies are in the beginning stages of understanding the full benefits of AI. The current usage in this field is only visible when losses occur or for known risks (Farouk, 2021).

3.7 Adopting AI Capabilities for Disaster Recovery

According to Turing et al., AI (Artificial Intelligence) is simply considered as a "thinking machine" (Turing & Braithwaite, 2004). It was described by Shukla and Jaiswal as a technique that can facilitate "a computer to do things which, when done by people, are said to involve intelligence" (Shukla Shubhendu & Vijay, 2013). With AI technology, machines can detect patterns that are too complex for humans to quickly detect and process. AI has been widely adopted in areas like machine vision, speech recognition, natural language processing, targeted marketing, and even in the healthcare management system, which includes using AI to combat COVID-19 (Davenport et al., 2019; Laghi, 2020). While other technologies like robotics, drones, smart sensors, virtual reality, and so on have all played positive roles in supporting health care professionals in managing and coping with the COVID-19 pandemic (Tavakoli et al., 2020; Zeng et al., 2020), AI will arguably be more instrumental in tackling some of the most striking and prevalent issues that both health care professionals and government officials are faced with. These issues include pandemic surveillance, drug and vaccine development for the coronavirus pandemic, and disaster recovery (Keshavarzi Arshadi et al., 2020; Laghi, 2020; Lin & Hou, 2020).

AI technology is very useful in searching for specific patterns or identifying trends and patterns across a large amount of data quickly and cheaply. For instance, AI can

extract data retrospectively from medical records or prospectively in real-time and process this data statistically for insights that can supplement any existing structured data to develop actionable information (Sharma et al., 2019). During the outbreak of the coronavirus, AI has been used to gather and analyze publicly available data, such as geolocation data, social media content, and content timestamps to identify and record potential cases of coronavirus in a cost-effective way without expending money on testing devices or employing clinical resources that involve health care professional (Klein et al., 2021).

As seen above, AI is irreplaceable in terms of handling complex tasks, which include extracting useful information from large datasets. However, considering the increasing advancement in technology and its applications, AI can be used as the main component in other emerging technologies (Jia & Yang, 2020), which can be used for disaster management and recovery. All these insights drawn from the COVID-19 pandemic (Keshavarzi Arshadi et al., 2020; Lin & Hou, 2020) suggest that AI has a great potential in disaster monitoring and managing.

AI technology, alone or when coupled with other advanced technologies, can be very effective in elevating disaster monitoring, control, and management (Kashif et al., 2021). That is, AI technology can be adopted to handle issues, such as early detection and identification of disaster, treatment design and development, public health interventions, and disaster recovery (through sentiment analysis using social media content. This study specifically focuses on adopting AI for disaster recovery taking COVID-19 unknown risk as a case study.

3.8 The Role of AI in COVID-19

COVID-19 is a global pandemic that was first identified in Wuhan city of China and exponentially started to spread across the world. This pandemic has changed the world significantly, not only for health care systems, but also for politics, education, economics, transportation, etc. Consider what makes COVID-19, as a crisis is its unknown nature as a virus and its consequences, as well as the speed at which it is spreading across the world. Although World Health Organization (WHO) and Centers for Disease Control and Prevention (CDC) have published instructions and regulations to reduce the risk of COVID-19 from spreading, it is still breaking out. Many countries considered this epidemic as a normal flu and ignored all advice released by WHO and followed the approach of herd immunity, but unfortunately this method made it worsen. This approach results in exploding the number of infected cases that eventually led those countries to issue a 24 h lockdown while preventing any type of gathering as well as closing their borders (Mayo Clinic, 2019). In response to this unknown risk, AI played an important role and it has been applied successfully in managing this outbreak.

Countries like Japan, Hong Kong, and South Korea combined lessons learned from H1N1 and SARS with the AI powered capabilities to process the unknown risk in real time which helped them to build defense and response systems to mitigate

losses associated with the COVID-19 epidemic (Rogers, n.d.). This proves that AI can analyze the anatomy of past crisis and apply that intelligence to the precautions that countries develop today as they prepare for the challenges of tomorrow. The truth is countries and organizations cannot predict the onset of the global pandemic (Akhtar et al., 2021; Aziz & Aftab, 2021). However, they can identify the telltale indications. AI can empower organizations to proactively spot growing unknown risk early and take decisive measures before massive loss occurs. Fortunately, AI and unsupervised machine learning are capable of analyzing, processing, and deriving actionable insight from all this data and can do so in real time.

3.9 Conceptual Framework and Hypothesized Relationships

Organizations are recognizing AI effects on the market and they became more interested in investigating AI as a new technology that can transform their management strategy. Unknown unknown risk is a big concern when it hurts the business without any contingency plan. Therefore, the ability of AI to predict and deal with the risk that might appear in the future is catching business attraction. Using AI to mitigate the upcoming unknown unknown risk in an organization can increase the chance of avoiding any loss. In addition, it will help the production to create new plans to reduce the risk. Moreover, they can manipulate it to their advantage, create an opportunity in having a change that exceeds that of opponents, and be the leader in the market. The objective of this research is to study AI capability towards unknown unknown risks negative consequences and the target audience for this research are organizations, project managers, and policy makers. Figure 1 represents the proposed hypothesis of this research.

H1: AI technology has a positive effect on mitigating unknown unknown risk.

4 Methodology

After a complete review of the literature, a qualitative method has been decided to be used to meet the objective and answer the question of this study, which is how AI can mitigate the impact of unknown unknown risks. A combination of secondary data and interview methods will be utilized. As secondary data, six case studies of different utilizations of AI in combating COVID-19 will be chosen to discuss the

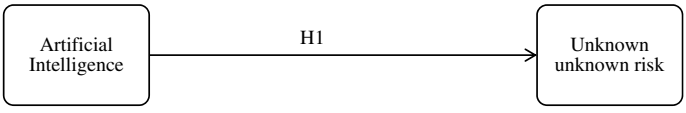

Fig. 1 Research conceptual framework

role AI played in mitigating the unknown unknown risk. In addition, a structured interview will be used to gather detailed information and the questions will be based on an open-ended approach. This data will help to better understand in which stage risk management processes can involve AI technology and the potential level of its capabilities in unknown events cases.

5 Data Collection

5.1 Case A: Canada BlueDot

The Canadian based AI model BlueDot that functions based on machine learning, predicts humans by spotting infectious disease outbreaks. It predicted the outbreak of the infection at the end of 2019 issuing a warning to its clients on 31 December 2019 before the WHO did so on 9 January 2020 (Kreuzhuber, 2020). A group of researchers who are working with the BlueDot listed the top 20-destination cities where passengers from Wuhan would arrive in the wake of the outbreak. They warned that these cities could be at the forefront of the global spread of the disease.

BlueDot aims not only to identify the threat of infectious diseases, but also to understand how diseases could spread to different parts of the world, then to determine the possible consequences of their spread. BlueDot was able not only to send out a warning, but also to correctly identify the cities that will be highly infected through using global air ticket data. It helped to predict where the infected people could potentially travel to. Eleven of the top listed cities were also the first areas affected by COVID-19 cases. For WHO, which is dependent on official statistics from Chinese authorities it was difficult to access such information and make forecasts early on (Pham et al., 2021).

5.2 Case B: China Detection System

CCTV based tracking was used in Asian countries to identify the potential infected people. China used infrared cameras to scan crowds for high temperature. Their AI powered system used facial recognition to identify individuals with high temperature and whether he/she is wearing mask. It is currently being used at Beijing's Qinghai Railway Station and it has the capability to inspect up to 200 people in one minute without interrupting passenger flow (Allam et al., 2020). This system also used to ensure citizens comply with self-quarantine instructions. According to reports, individuals who ignored the instruction and left home would get a call from the authorities after being tracked by the system (Preethika et al., 2020).

5.3 Case C: Dubai Police Movement Permission

The Dubai government announced a 24-h sterilization program, which aims to reduce the physical contact between people and speed up the sterilization program. Dubai Police used AI to find if the trip was for the reason claimed in the permit request. AI was used along with speed radars to identify which vehicle has a movement permit or belongs to people working for important sectors. In addition, if a vehicle did not get a permit and went out for necessary purposes, AI can recognize the route and check if this trip was in fact for an important matter. Plus, the system has the capability to identify the path a person takes when they work in vital sectors and it will know the route from home to work.

5.4 Case D: IBM Watson Assistant

Watson Assistant is a conversational AI platform that provides an engaging experience for users to get even their most complex issues solved by using supported chat and speech interfaces. It was preprogrammed with COVID-19 questions via the IBM cloud. Organizations in 12 countries from the city of Austin to the Polish Ministry of Health have been able to get up and running in as little as 24 h (Hanford, 2005). The objective of this type of technologies is to help reduce the waiting time for calls those users make to the telephone lines of state services relating to the novel coronavirus. In addition, it provides data driven insights to help employers make informed decisions on workplace re-entry, facilities management, space allocation, and other covered related priorities.

5.5 Case E: Microsoft Azure AI—ImmuneCODE

Biotechnology and Microsoft collaborated in launch an immuneCODE that is an open database to share an immune response toward COVID-19 blood samples from patients around the world. The database contains information details on "T" cells, which specifically recognize features of the virus with unprecedented scale and speed. This cell has trove of information that can provide one consistent trackable measure of immune response. In addition, it can help in diagnosing and managing COVID-19 and provide accurate assessment of immunity. As a result, data from the immuneCODE will speed up vaccination development, provide better diagnose, and reduce the spread of the virus (Microsoft, 2020). According to Kevin Scott (2020), Microsoft is using similar supercomputing capacity that have been used before for natural language process to run molecular simulation to identify potential therapy for COVID-19.

5.6 Case F: Facebook Fighting Misinformation

Facebook uses AI model to detect and track false news written in text and images effectively. The software is trained to find duplicated or slightly modified version of that content as it spread across the platform in different languages (Statt, 2020). It can recognize and track both the copy and the original image with perhaps one changed word in the post. It can recognize whether the images contain false claims or misleading information about COVID-19 and apply warning label automatically (Statt, 2020). The system is applied to every image that has been uploaded on each platform, Instagram, and Facebook, which means billions of images are being checked per day in their database.

6 Analysis

6.1 Case A

BlueDot was able to identify the crisis and the cities that will be affected by this disease that gives it the advantage of early prediction of such pandemic. It alerted the Canadian entity about this pandemic 8 days before the WHO announcement, which presents its effectiveness in early prediction (BlueDot, n.d.). It also assisted in understanding how disease might scatter to different parts of the world and then determined the potential impacts. It pointed out which cities had the risk of transmitted COVID-19 despite having no official cases (BlueDot, n.d.).

It required human interpretation and providing context to recognize the threat. In fact, even in the case of BlueDot, human remains central in evaluating and interpreting its output. Therefore, it is correct to stress that human input across disciplines is needed for the optimal application of AI.

6.2 Case B

Case B used IOT devices as CCTV based on AI and machine learning algorithm. It was able to detect infected people. In addition, it was used to track those who are not following the guidelines and report them. The data that was collected was interpreted and transferred to the concerned person in the organization for interpreting them, conducting results, and creating an action plan. Their main goal was to identify areas of vulnerability in early stages to avoid surprises by managing potential aspects, which can lead to occurrence of risk overtime. The shown AI system takes a whole CCTV as an input and runs a quick diagnosis to be able to provide the abnormal cases as an output.

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6.3 Case C

In Case C, they used AI to track people who got the permission in advance along with the ability of taking a decision regarding the fines, whether it is eligible or should be removed. The new understanding of the technology can be result in evaluating the current situation and making sense of a complex pattern of different aspects. Their aim was to produce a fast-reactive mechanism to various changes and pro-act to them. The effectiveness of their method was depending on the speed of analyzing the vehicle data. This system assisted in automating the validation processes, which in usual cases take days to be verified and can sometimes include human error (UAE Government, n.d.).

6.4 Case D

Case D used machine learning to enable chatbots to interact with people and take decisions in responding to different inquiries from them later on. In addition, it automates the call center work to speed up the efficiency of this service and effectively carry out the process. The success of this mechanism depends on the level of maturity of the organization in feeding up the basic knowledge and questions to the AI. As well as, expanding the sharing data for more than 12 countries for better proactive responding. Effectiveness and coverage are the two measures that provide the overall performance of Watson. With COVID-19, it succeeded because of its capability in responding to most inquiries well (Benvie et al., 2020).

6.5 Case E

Azure ML empowers researchers and medical organizations in responding to COVID-19 and it accelerated solutions to react against the global pandemic. The accuracy of the immune response will be continuously enhanced and updated online in real time as extra samples are sequenced by using MS Azure cloud and ML capabilities. The objective of this collaboration is to speed up the vaccination research and identify the patterns of this virus in timely manner.

6.6 Case F

Facebook AI system's goal is to reduce the spread of misleading information across the program. In addition, it helps them to demonstrate their commitment to keep

Table 1 Summary of AI contribution

Case	Decision Making	Early prediction	Tracking and detection	Automation processes	Cost efficiency
Case A	•	•	•	•	•
Case B	•	•	•	•	•
Case C	•		•	•	•
Case D	•			•	•
Case E	•	•	•	•	•
Case F	•	•	•	•	•

Facebook and Instagram safe and genuine with the content uploaded in these platforms. It uses the three-pronged strategy of informing, reducing, and removing. It starts with informing users of recognizing false news. Then, it reduced the distribution and appearance of false news that has been labeled. Finally, it removes the fake posts and disable the accounts. According to Facebook Community Standards Enforcement Report, the fake accounts represent approximately 5% of their users and were around 1.5 billion accounts in the second quarter of 2020. In addition, 99.6% accounts were flagged with through their system before the other users reported them (Facebook, n.d.).

After analyzing, we came up with five main tangible roles that AI played in COVID-19. Table 1 illustrates the identified influences in each case.

Another analysis was done to demonstrate the AI contribution in each risk management process based on analyzing the six case studies. The results were based on correlating between the functionality AI provided in each case with the elements of each risk management processes as shown in Table 2. It is clearly shown that AI can help in developing a consistent, and integrated risk management methodology to help determine how best to identify, manage, and mitigate significant risk through the organizations.

6.7 Effectiveness of AI

Table 3 addresses the six cases with using and without using AI for measuring the effectiveness of utilizing AI in COVID-19 and any future unknown events.

In addition, we did a quantitative measurement of using AI technology in respect to the following metrics: speed, adoption, response, availability, and cost reduction. The scale of assessment will be from 1 to 5 where 5 presents excellent and 1 is low. The scores are based on the researcher's point of views from each case.

Table 4 illustrates that the five measurements reveal the effectiveness of utilizing AI in mitigating unknown risk. As shown in Table 4 most of the scores were between 3 and 5 which indicate that AI has a strong potential in mitigating unknown unknown risks. AI based systems are always available and were not impacted by working

Table 2 AI in risk management processes

Sr	Case	Planning risk management	Risk identification	Qualitative analysis	Quantitative analysis	Planning risk response	Implement risk response	Monitor risk
1	Case A	•	•	•	•	•		•
2	Case B	•		•	•		•	•
3	Case C	•		•	•		•	
4	Case D	•		•	•	•	•	
5	Case E		•	•	•			•
6	Case F		•	•	•	•	•	

from a distance and being on lockdown. AI quickly adapted the change with the pandemic and assisted in reducing the cost of operations that required human involvement such as responding to customer questions, monitoring people's movement, and checking the logs of violators. Moreover, it contributed in automation of many repetitive and manual processes that have been impacted by implementing working from a distance. In addition, AI participated in the better understanding of this unknown risk through analyzing the patterns and turning it to become known as well as provided recommendations on how to react in different stages of this disease.

7 Discussion of Results

After analyzing the six case studies, the results that were obtained within the previously described method for each case of using AI technology can be summarized in the main roles of rapid response, namely, decision making, early prediction, automate processes, and detection and tracking. We can consider AI as a game changer for accelerating cognitive abilities and economic benefits. AI and machine learning can help proactively prepare for unknown unknown risk. In the COVID-19 case, we found that most companies have focused so far on reactive measures, but now it is the perfect time to take transformative action and be proactive. Companies that have already introduced AI should press ahead immediately in order to achieve maximum advantage in the near term. They should not hesitate to scale up because AI will be a significant level that can help them manage this crisis and future unknown unknown risk. The following are the main AI roles found in mitigating unknown unknown risk:

Table 3 Measuring AI effectiveness—qualitative

Case	Without AI	With AI
Case A	Human needs time and effort to analyze and find the pattern to predict the pandemic as well as he will be observing and waiting for other countries to report the infected cases. WHO took 9 days after BlueDot results to announce the pandemic	Predicted the pandemic before the WHO announcement and reported the top 20 cities that will have the virus thorough correlating between the airlines' tickets and infected cases in city Wuhan. 11 cities were correct from the list
Case B	CCTV will not be able to detect and take actions against any infected cases and it will require human intervention to verify the videos and report the violators	AI directly detected the infected cases once they passed through the CCTV as well as identified the violators who are not wearing masks
Case C	Requires human review that will take more than a week to verify each video recorded and map it to the permissions	AI could identify the violators within seconds and take the decision to issue fines
Case D	The customer service agent will take time to ask for the answer and respond to the phone call inquiries and sometimes the responsible person is not available to answer and that can take more than one day	A direct response is available to any inquiries because of the data that has been fed to the machine learning and any unknown question will be reported to a higher level as a quick reaction
Case E	The process of analyzing the T cell will be very slow and it will require time and efforts to study all the samples and find the common pattern which in some cases requires months. Even sharing data will require many approvals and permissions. This will lead to put huge pressure on medical organizations which are already overwhelmed with infected cases	AI speed up the analyzing process because of the open public database to find the common attributes of the virus as well as it provided better diagnose. It helped to drive model in a day instead of months which is normally required using older technique
Case F	The process of tracking the source of fake news requires times as well as it is very hard to identify the news if its true or fake	AI speed up the process of verification and assisted in tracking the sources of fake news in seconds instead of weeks. In addition to its capability to automatically takes the decision to remove the news

Table 4 Measuring AI effectiveness—quantitative

Case	Metric				
	Speed	Adoption	Response	Availability	Reduce cost
Case A	5	4	4	5	4
Case B	4	4	4	5	4
Case C	4	4	5	5	5
Case D	4	4	3	5	4
Case E	4	3	4	5	4
Case F	4	4	5	5	3

7.1 Rapid Response

During any pandemic, the role of technology rises and shines. For example, in COVID-19, AI and big data showed an extraordinary role in solving problems and increasing the potential for response to any future circumstances. It played a significant role in diagnosing coronavirus patients. Thus, AI enabled rapid and ongoing adaption and recognition to the new abnormal and can be open to change (Alnazer et al., 2017; Haitham Alzoubi & Ahmed, 2019). It improves the adaptability required to address changing conditions at every step of the unknown unknown risks. It is able to process the combination of structured and unstructured data in a massive amount, which shows the patterns and results in decision-making.

7.2 Decision Making

AI is a decision support system that allows domain experts to generate diverse alternative scenarios of the future and imagine different possible outcomes including unlikely, but potentially impactful future (FERMA, 2019). Any unknown risk has an impact on any business and the effect can be long-term, so utilizing technology that can think and learn is a great opportunity. The top management can benefit from the technology through better decision-making, providing great productive insights and visibility of risk that can be delivered by AI. The organizations that benefited from the AI vital role in fighting against COVID-19 will assist the future developments in their decision-making strategy (Alzoubi et al., 2020a, 2020b). AI technology has the ability to use secondary data to provide reference suggestions when people are unsure or when there are multiple decisions (Jin et al., 2020).

7.3 Improve Cost Efficiency

AI helps organizations to improve their work efficiency through reducing cost of the processes by automating day-to-day assistance and guidance in the risk management process (FERMA, 2019). For a small organization with few resources, AI can propose a method to achieve rapid and accurate risk assessment, which result in proper allocation of the limited resources. This means that AI led to substantial savings in term of human resources and improved emergency repair, efficiency, and decreased the risk of infection for individuals within the organization (Alzoubi & Yanamandra, 2020; Mehmood et al., 2019). The ability of adapting to different requirements can be considered as a benefit in the resources.

7.4 Early Prediction

Unknown risk has warning signs and if we can identify them and act against minor events, then perhaps we can avoid losses. It is important to obtain an early indication of negative risk development that will become noticeable in the future (Hajikazemi et al., 2016). AI can be used to identify abnormalities in certain areas of data storage. With the huge amount of data, you would not see them as a person, whereas the machine now is enabling us to notice them. It has the potential to exceed humans, not only through speed, but also by dictating patterns, which humans have overlooked. These patterns will be taken under consideration and will generate many different scenarios exploring a variety of possible outcomes (Alzoubi & Yanamandra, 2020; Joghee et al., 2020). The top management roles come to prepare the organization to deal with realistic circumstances for both expected and unexpected futures.

7.5 Automate Processes

Automate repetitive tasks that a human does every day, but in doing so we are going to create work that will allow people to do more complex and judgment-based pieces of work that will enhance their ability to engage in the job. It conducts enterprise risk assessment through identifying risk materials in the organization, by calculating inherent risks using likelihood, impact, and analysis model. Second, it evaluates and redeems the risks by using context models to determine an action, such as accepting, monitoring, or treating. Then it performs residual risk analysis after controls are applied. Finally, it schedules risk assessment by running periodic risk assessment for analysis and evaluation. Not to mention, it has a self-learning feature which means the embedded self-learning feature of AI will keep learning for accurate results in the future. AI technology has shown good performance during the pandemic and can be used with different diagnosis levels, according to different policies that humans teach it. The system will keep learning and reach to experienced levels, which later on will automatically produce the output of the matter (Alshurideh et al., 2020; Alzoubi et al., 2020a, 2020b; Jin et al., 2020).

7.6 Detection and Tracking

Organizations need to analyze their risk profile through the competence of their risk management framework. The insufficient knowledge and the complete lack of awareness about their existence can make it hard on organizations to detect. This may lead to losses due to inadequate experience and interaction with the available risk management system (Emerging). Detecting and tracking symptoms with AI can lower the possibility of losses and will lead to the creation of a relevant credible

management model. This creates the opportunity to plan different scenarios and strategic foresight, which must go beyond the conventional approaches due to the emerging risk occurring from the complex and interrelated event. For example, in the COVID-19 pandemic, AI technology was able to track the suspicious cases and forecast the nature of the virus from the feed up data about the risk infection and the likelihood of spreading (Alnuaimi et al., 2021). The monitoring feature resulted in predicting the possible positive cases and the regions in which they are likely to be present. Thus, it provided daily updated information, which aided in giving the possible measurements to prevent the virus from spreading accordingly.

8 Limitation

Many papers admitted that AI in some cases struggled due to lack of data. In fact, the successful implementation of artificial intelligence is dependent upon the data set and creativity of the humans who are deploying it to mitigate the unknown unknown risk. The value of AI and its application in exceptional times like the coronavirus pandemic stems from the human input that goes into its design process (Alzoubi & Aziz, 2021; Alzoubi et al., 2021). To realize the full potential of AI, it is necessary to marry innovation and human action together, so that we can win the war against any type of unknown risk with reduced losses.

9 Recommendations

The following are recommendations to enhance the role of AI in risk mitigation.

- Governments must put in place the necessary supporting technology, regulations, and governance to enable large-scale adoption in response to unknown unknown risk.
- Promote co-operation, and data exchange both on a national scale and globally by the AI community, and policy makers to contribute in preparing for the problem, recognizing important data and launching datasets for unknown unknown risk.
- Dedicate research on AI technologies that can understand from limited data.
- Build AI-powered monitoring tools that empower research without affecting privacy.
- Initiating emerging risk governance framework that contains new approaches to the risk management strategy, operational processes, and measurement of exposure to them.
- Integration AI with other technologies such as blockchain, big data, and cloud to achieve better efficiency in reacting to pre and post unknown unknown risk.

10 Conclusion

In conclusion, it is clearly seen that AI can be a game changer for mitigating unknown unknown risk. The capability of this technology, which was proven during the COVID-19 pandemic, is that it could be a valuable source to combat black swan events. In this research, we have presented a state by utilizing AI technology to address numerous challenges posed by the coronavirus pandemic. Six main applications of AI potentials for coping with COVID-19 crisis have been analyzed all through (Ali et al., 2021; Ghazal et al., 2021a). As a result, this research acknowledged that AI and machine-learning technology are enabling the shift by providing the tools to support remote communication, enable telemedicine, and protect food security. In addition to its capability of early prediction, tracking and detecting, decision-making, and process automation, we believe AI-driven algorithms could deliver valuable predictions and readings in the future. Companies do not require completely new processes for dealing with AI, but they will need to improve existing ones to consider AI and fill the necessary gaps (Alhamad et al., 2021; Kurdi et al., 2021). For best utilization, it is recommended to increase data sharing, in addition to having access to different historical data with the ability of pulling data from the right sources. However, the biggest challenge is to create a convincing and reliable global data set of different risks identified among the nations with possible different metrics. Adoption of AI requires from companies to go through a learning journey and to work in a more scientific mind-set.

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The Role and Impact of Big Data in Organizational Risk Management

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Abstract Technological advancement has exposed companies to various risks. With the adoption of technological infrastructures in many companies, various processes have been rendered vulnerable to different forms of threats. Evidence from the current empirical studies on organizational management indicates effective risk assessment is a crucial aspect in any organization. Global technological advancement has equally redefined risk assessment and management strategies. Global leading technology companies such as Apple Inc., Amazon Inc., and Google are leveraging modern technology to unlock hidden data to aid in risk assessment and management. As evidenced in this research report, the use of big data has revolutionized risk assessment in many companies across the world. Big data technology has enabled organizations to collect, store, and assess huge information to aid in risk assessment and management. The processes of risk identification, assessment, mitigation, monitoring, and reporting have been redefined due to the adoption of big data analytical technology. As a result, this research reviews the specific roles played by big data in organizational risks management. The research carries out a comparative case study analysis among three companies that utilize big data in risk management. Specifically, the roles of big data technology in risk management at Apple Inc., Amazon Inc., and at Google are identified. Results from this comparative analysis are used in formulating recommendations for various organizations that desire to adopt big data analytical technology in risk management.

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_117

Keywords Big data · Big data analytics · Organizational risk management · Project risk management

1 Introduction

Over the years, organizations have been implementing various risk assessment strategies to identify and prevent threats that hinder competitiveness. Risk assessment has been a central aspect in many organizations based on its ability to identify factors undermining performance. The proliferation of digital technology has redefined the need for risk assessment in many organizations. The incorporation of technological infrastructures has influenced many organizations to prioritize risk assessment due to various threats (Alshurideh et al., 2019; Agha et al., 2021; Kurdi et al., 2020). The advent of digital technology has exposed many organizations to several risks. Arguably, unlike in the analogue era, organizations are currently utilizing modern technology to formulate effective risk assessment tools. Presently, technological risk analytic and data mining tools such as big data have been adopted to help organizations identity, assess, mitigate, monitor, and report the progress of various threats. Global-leading technology companies such as Apple Inc., Amazon Inc., and Google rely on data mining tools such as big data in assessing and managing risks (Al Shebli et al., 2021; Lee et al., 2022a, 2022b; Naqvi et al., 2021). While several data mining techniques are used by organizations in risk assessment, the use of big data has proved to be effective because it unlocks hidden information enabling an organization to make accurate and data-driven risk management decisions (Al Alwan & Alshurideh, 2022; Batayneh et al., 2021; Tariq et al., 2022a, 2022b).

2 Background

Organizations in the current world have adopted digital technology in almost all of their processes. Apart from leading to efficient, reliable, and accurate product and service delivery, technological adoption has led to the collection of information (Ahmed et al., 2021; Almaazmi et al., 2021; Dicuonzo et al., 2019). Also known as big data, the collected information has been valuable in enabling organizations to formulate customer-centric business models (Ahmad et al., 2021; Alshurideh et al., 2022). Guided by the importance of data in the contemporary world, Almeida (2017) argues that risks assessment can effectively utilize big data technology.

Big data has been a crucial aspect of risk management because it has helped organizations to collect, store, evaluate, and apply data originating from different sources. The approach adopted in big data analytical strategies has enabled many organizations to detect, assess, mitigate, monitor, and report all forms of risks that might hinder continuous operations (Alshurideh, 2022; Shabbir & Waheed, 2020).

Defined as a structured and unstructured software that is used in collecting information during the daily operations of an organization, big data has proved to be a vital risk assessment tool due to its ability to unlock some hidden information (Ahmad et al., 2021a, 2021b, 2021c; Ali et al., 2022).

According to Tang and Karim Khondkar (2017), the effectiveness of risk analytics is determined by the ability of an organization to carry out a holistic assessment. This process should assess and determine some of the hidden risks that might affect seamless operations. Notably, adopting data-driving analytical strategies enables organizations to unlock some hidden and crucial information that leads to the formulation of an effective risks assessment strategy (Alshraideh et al., 2017; Ben-Abdallah et al., 2022; Hanaysha et al., 2021a, 2021b). Guided by the vital roles played by big data in risk management, it is essential to carry out research that will provide a practical application of this data-driven technology in preventing various organizational threats.

2.1 Research Problem

Technological advancement has exposed several organizations to numerous risks. Apart from fostering efficient, reliable, and convenient products and services provision, the digital technology being used by organizations has exposed them to several risks. Unlike in the analogue era, the increased risks facing organizations have led to the demand for the formulation of a more accurate and data-driven strategy that can effectively assess and manage various risks. An increase in technological risks faced by organizations has led to the demand for a more effective management strategy (Tang & Karim Khondkar, 2017). As a result, this research focused on solving the current challenge of increasing cases of technological risks faced by organizations by analyzing the roles played by big data. Specifically, this research reviews the use of big data analytical technology in solving various risks faced by organizations (Alhamad et al., 2021; Shamout et al., 2022a, 2022b). With reference to the application of big data technology in leading companies, this research formulates effect strategies that should be utilized by organizations to identify, assess, mitigate, monitor, and report various risks (Alshurideh et al., 2021; Amarneh et al., 2021).

2.2 Research Objectives

The primary objective of this research was "*To determine the roles played by big data in organizational risks management*". Other objectives of the research were "*To determine the practical applicability of risks assessment in leading organizations*" and "*To determine how big data is used in risk identification, assessment, mitigation, monitoring, and reporting*". Achieving these objectives was effective in solving the

research problem and enabling the researchers to identify the critical roles played by big data in organizational risk management.

2.3 Research Questions

The whole of the research process aimed at answering the following four questions.

i. What is the role of big data in organizational risk management?
ii. How is big data applied in the management of risks at Apple Inc.?
iii. How does Amazon Inc. utilize data mining technologies such as big data to assess and mitigate various risks?
iv. How does Google utilize big data in risk management?

Notably, answering the above four research questions was vital in enabling the researchers to formulate effective risks management strategies that organizations can utilize to overcome various risks. Specifically, the questions were significant in analyzing the practical application of big data technology in organizational risk management in the contemporary world.

2.4 Significance of the Research

Despite the existence of literature on the use of big data in achieving effective customer management, there is a dearth of data detailing the role of big data in organizational risk management. In effect, this research was vital in filling the existing gap by analyzing how big data is utilized in assessing and managing organizational risks (Dicuonzo et al., 2019). literature from this research will be vital in filling the existing research gap. Researchers will build on the findings of this study to carry out further analysis on the application of data mining technologies in organizational risks management.

Moreover, this research is very important because it formulates strategies that can be applied by organizational management and the risks management departments in the course of assessing and managing various threats (Hanaysha et al., 2021a, 2021b). Guided by the advent of digitalization in many organizations, the findings of this research will be used as a guide that will influence the adoption of big data analytical technology in risk assessment and management. Notably, carrying out this study is vital in identifying the roles and benefits of using big data mining technology in organizational risks management.

Lastly, the comparative case study analysis approach adopted in this research was vital in enabling the researcher to solve the current problem of technological risks being witnessed in various organizations. The adoption of digital technology in many organizations has exposed many processes to various risks (Hamadneh et al., 2021; Rui et al., 2022). These risks can only be solved by adopting a data-driven risk

management strategy (Shabbir & Waheed, 2020). Adopting big data analytics fosters the aspects of accuracy during risk identification, assessment, mitigation, monitoring, and reporting. As a result, the comparative case study analysis carried out in this research was vital in creating practical applicability of big data in organizational risk management.

3 Literature Review

Technological advancement in the contemporary world has influenced scholars to carry out studies to identify the roles played by big data in organizational risks assessment and management (Lee et al., 2022a, 2022b). Evidence from the studies by Kumari (2018) indicates data mining technologies such as big data analytics have revolutionized organizational risk management. On the other hand, Shabbir and Waheed (2020) postulate that the application of big data analytics in risks management has enabling organizations to uncover critical data that has led to the formulation of a more accurate and applicable risk management strategy. The studies by Tang and Karim Khondkar (2017) justify the use of big data technologies in organizational risk management by holding that this approach enables managers to make accurate and data-driven decisions (AlHamad et al., 2022). Literature from the current studies identifies various roles played by big data analytics in enabling organizations to assess and manage different risks (Ali et al., 2021). Some of these roles are discussed in the subsequent sections.

3.1 Big Data Analytics is Used in Fraud Prevention

Studies by Shabbir and Waheed (2020) analyzed the role of big data analytics in preventing various forms of frauds experienced in organizations. Evidence from this study indicated that big data analytics have the capability of detecting different forms of fraud. Organizations in the contemporary world experience various forms of financial frauds caused by employees and other stakeholders. However, Jin and Liad (2021) suggest that big data analytics enables an organization to collect big volumes of data that detect and prevent any form of fraud in an organization (Shamout et al., 2022a, 2022b). On this regard, organizations should consider adopting big data analytics to prevent the rising cases of fraud.

3.2 *Big Data Analytic Help Organizations to Manage Various Risks Associated with Third Parties*

Most organization outsource different services from third party companies. According to Choi et al. (2018), some of these third parties end up causing significant risks to organizations. For instance, an organization outsourcing technological services such as cloud computing from third-party providers' risk facing challenges related to cybersecurity (Choi et al., 2018). On the other hand, an organization that deals with different vendors is always prone to several risks originating from these third party suppliers (Kumari, 2018). As explained by Kumari (2018), risks originating from third parties can easily lead to the collapse of an organization (Alnuaimi et al., 2021). Big data analytics has been crucial in enabling organizations to collect a huge volume of data that can easily detect any form of external threat (Alzoubi et al., 2022). The collected data has been utilized in assessing threats from third party companies and formulating effective mitigation strategies (Kumari, 2018). Results from the studies by Jin and Liad (2021) indicates that organizations that depend on big data analytics have well-established risk management approaches that prevent any form of external threat.

3.3 *Big Data Analytics Have Been Vital in Reducing High Customer Churn Rates and Preventing High Employee Attrition*

Customers and employees are two vital stakeholders in any organizations that determine its growth and development. According to Dicuonzo et al. (2019), organizations that achieve customer loyalty and retention register continuous growth and development due to the increased sales (Joghee et al., 2020). On the other hand, Cole et al. (2015) hold that employees are a driving force that ensures continuous operations in any organization. In this regard, increased customer churn rates pose critical risks that might result in the collapse of an organization. As explained by Cole et al. (2015), the increased customer churn rate reduces the total market share of an organization rendering it uncompetitive. Similarly, high employee attrition leads to low-quality service delivering hindering an organization from meeting its objectives. Consequently, the research by Almeida (2017) concludes that the adoption of big data analytics prevents the risks associated with increased customer churn rates and employee attrition. By applying big data analytics, organizations collect numerous information based on different customer segments (Alnazer et al., 2017). The company counters the risks of high customer churn rates by identifying various factors that hindering customer satisfaction (De Mauro et al., 2018). Additionally, high attrition rates among employees can be easily detected, analyzed, and manipulated by using big data analytics (Alzoubi & Aziz, 2021). The adopted big data

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analytics identify the specific needs of employees and formulates ways of fostering retention.

3.4 Big Data Analytics Foster Operational Assessment and Enables Organizations to Manage Various Forms of Digital Risks

Big data technology enables organizations to collect, store, analyze, and apply big chunks of data in the course of assessing and managing different forms of risks. Operational risks are some of the common threats facing organizations in the contemporary world. Companies experience different risks originating from different organizational processes (De Mauro et al., 2018). Ineffective management of these risks threatens the stability of any organization. In this regard, the adoption of big data analytics has proved to be effective in handling various operational management threats. Similarly, research by Vassakis et al. (2018) revealed that adopting digital technology has led to the existence of several risks in the contemporary world. However, Jin and Liad (2021) established that relying on big data analytics has proved to be effective in dealing with various threats associated with digitalization (Ghazal et al., 2021). Notably, organizations should consider adopting big data technologies in achieving accurate, data-driven, and appropriate risk assessment and management.

4 Methodological Approach

4.1 The Research Design

The methodological approaches adopted in any research determine the effectiveness and viability of the research findings, conclusions and recommendations. As explained by Schoonenboom and Burke (2017), the methodological approaches adopted in any research are equally important in determining the accuracy of the collected data. This research adopted a hybrid research strategy that collected both qualitative and quantitative data. The hybrid or mixed-method research design adopted a case study analysis. The comparative case studies aimed at determining the specific roles played by big data in organizational risk management (Alzoubi et al., 2021). As evidenced below, qualitative and qualitative secondary data was collected from the case studies on how Apple Inc., Amazon Inc., and Google utilize the data mining technology of big data analytics in managing various forms of risks.

4.2 Case Study Analysis

Guided by the developed research design, researchers carried out a comparative analysis that reviewed the application of big data analytics in risk management in Apple Inc. Amazon Inc., and at Google. The comparative analysis aimed at establishing the specific roles played by big data analytics in assessing and managing various risks.

4.2.1 Case Study 1: The Role of Big Data in Risk Management at Apple Inc.

The utilization of big data has proved to effective in managing various forms of risks at Apple Inc., as explained by PathakJan (2021). Apple Inc. adopts a Siri voice recognition big data technology that collects, stores, analysis, and applies the collected data. According to PathakJan (2021). Apple Inc. has been relying on its big data collection and analytical strategy to improve counter various risks. Just like other leading technology companies, Apple Inc. utilizes the big collected data to identify, assess, mitigate, monitor, and report various risks (Alzoubi et al., 2020a, 2020b). For instance, internal risks associated with financial transactions, employee attrition, high customer churn rates, and threats posed by third-party organizations (AppleInc, 2021). As of the leading technology companies, Apple Inc. has shifted to the use of data mining analytics to accurately assess and manage various risks (Alshurideh et al., 2020). The *Siri* voice recognition technology is utilized by this company in collecting big data has been essential in detecting different forms of risks and formulating mitigating strategies before occurrence. As explained by Sun et al. (2020), apart from enhancing customer relationships management, the big data analytics used by Apple Inc. have been vital in formulating recovery strategies that foster continuous growth and development. Similar to the risks management strategies used by both Amazon Inc. and Google, Apple Inc. has been utilizing this big data technology in unlocking some of the hidden information that threatens seamless operations in the company.

4.2.2 Case Study 2: The Role of Big Data in Risk Management at Amazon Inc.

The business model adopted by Amazon Inc. has exposed it to numerous risks. As a company that relies mostly on third-party vendors, Amazon Inc. is always vulnerable to various risks (Alzoubi & Ahmed, 2019). However, the company has been utilizing effective data mining technologies to detect, assess, mitigate, monitor, and report various forms of internal and external risks (Amazon, 2021). Ranked among the global leading technology companies, Amazon Inc. collects, stores, analyses and applies big data in all of its business processes (Mehmood et al., 2019). The

cloud computing technology adopted by Amazon Inc. utilizes the *AWS* big data software to assess and manage different forms of risks, essential in collecting, storing, processing, and applying big data (Amazon, 2021). According to Galea-Pace (2021), the application of big data at Amazon Inc. has been vital in mitigating risks associated with business strategy, compliance and regulatory risks, financial risks, and other operational risks. As the leading e-commerce platform in the world, the big data collected by Amazon Inc. has been vital in enabling it to make accurate and data-driven risks management decisions. Just like Apple Inc. Amazon Inc. has been utilizing big data analytics to prevent various forms of internal and external fraud, lower retention and churn rates from employees and customers, respectively. Moreover, big data analytics used at Amazon Inc. have been vital in managing third-party risks and mitigating threats associated with operational processes.

4.2.3 Case Study 3: The Role of Big Data in Risk Management at Google

Google is the global-leading technology company that offers different products and services. As a global leading technology company, Google faced both internal and external risks that require effective management approaches (Aziz & Aftab, 2021). According to Sun et al. (2020), technological advancement has led to the adoption of big data analytics at Google. Apart from enabling the company to offer customer-centric products and services, the big data analytics adopted by Google Inc. has been essential in assessing and managing various forms of risks. Google collects big data using different software (Alzoubi et al., 2020a, 2020b). The collected data is then stored, analyzed, and applied in managing different forms of risks (Google, 2021). Google has prioritized the use of big data in risk assessment by identifying risks at an early stage and crafting effective mitigation strategies (Radwan & Farouk, 2021). According to Sun et al. (2020), the use of big data at Google has enabled this company to prevent risks associated with fraud and those originating from third party companies. Just like Apple Inc. and Amazon Inc., the use of big data at Google has been vital in mitigating operational risks that threaten the competitiveness of this company (Cruz, 2021). Notably, big data has proved to be effective because Google is among companies that detect and manage different forms of risks at an early stage.

5 Results and Discussions

It is evidenced from the comparative case study analysis that big data plays vital roles in organizational risk management (Eli, 2021). Guided by the data collected in this research, big data analytics is an essential data mining technology that is used in leading organizations such as Apple Inc., Amazon Inc., and Google to detect, assess, mitigate, monitor, and report various risks (Lee & Ahmed, 2021). As evidenced in

the concepts developed in the literature review, big data analytics plays the following risk assessment and management roles.

Firstly, big data analytics collects large sums of data that is used in detecting and preventing any form of internal and external fraud (Kashif et al., 2021). As evidenced in a study by Almeida (2017), big data technologies have been essential in detecting any form of internal and external fraud in organizations (Akhtar et al., 2021). The detected threat is quickly analyzed, and accurate data-driven mitigation strategies are implemented. Secondly, evidence from this research showed that organizational risks associated with third-party service providers or vendors could effectively be management by big data technologies (Alzoubi & Yanamandra, 2020). According to Dicuonzo et al. (2019), technological adoption in many organizations has led to increased outsourcing. Leading companies like Amazon Inc. rely heavily on external vendors and other third-party product and service providers. Such companies are always exposed to several risks that can be effectively mitigated by big data analytics (Alsharari, 2021). The data mining technology of big data collects large sums of data that can easily detect and manage risks associated with third-party companies and customers (Mehmood, 2021).

Thirdly, evidence from this research shows that big data analytics has been vital in reducing employee attrition rates and countering the increasing customer churn rates. As stated by Shabbir and Waheed (2020), employees and customers are vital stakeholders in any organization. Any risks that prompt either employees or customers to lose interest or loyal in an organization causes detrimental effects (Tang & Karim Khondkar, 2017). In this regard, the adoption of big data analytics enables organizations to assess various factors that lead to increased rates of employee attrition and craft effective mitigation strategies (Miller, 2021). Similarly, big data technologies are used to collect data on different customer segments (Khan, 2021). The collected data is analyzed to determine factors leading to the increased rates of customer churns. Effective strategies are equally established to mitigate these challenges.

Lastly, results from this research showed that adopting big data analytics is crucial in assessing and managing risks associated with organizational processes and other digital threats (Mondol, 2021). As stated above, technological advancement has led to increased demand for digital technology. Most of the organizational processes are currently executed using digital technology (Cole et al., 2015). Despite being effective in fostering the aspects of reliability, convenience and efficiency, digitalization has caused numerous risks in many organizations (De Mauro et al., 2018). Many of the organizational processes have been exposed to both internal and external risks caused by digital technology (Alzoubi, 2021a). However, big data analytics has been crucial in enabling companies to counter risks associated with organizational processes and other digital infrastructures (Guergov & Radwan, 2021). As evidenced in this research, big data analytics detect, analyze, mitigate, monitor, and report different form of risks associated with organizational processes and digital technology.

6 Conclusion and Recommendations

It is evidenced from this research that organizations have been implementing various risk assessment strategies to identify and prevent threats that hinder competitiveness. The effectiveness of these strategies has been based on their ability to timely identify, analyze, mitigate, monitor, and report various risks facing organizations (Al Ali, 2021). With the growth of digital technology, the demand for data mining software such as big data has been on the rise (Farouk, 2021). As shown in this research, big data has been vital in enabling organizations to craft customer-centric business models. Apart from helping companies customize their products and services in various markets, big data has been vital in organizational risk management. It is shown that big data analytics enables organizations to identify and mitigate various forms of risks (Obaid, 2021). As a result, while several data mining techniques are used by organizations in risk assessment, the use of big data has proved to be effective because it unlocks hidden information enabling an organization to make accurate and data-driven risk management decisions.

Guided by the findings of this research, it is vital for companies to consider utilizing big data analytics in solving various risks associated with organizational management. Implementing big data risks management strategies will enable organizations to make data-driven decisions in the course of solving various threats (Alzoubi, 2021b). Additionally, big data technologies will be essential in enabling organizational managers and risk management officers to detect risks at the early stages and utilize accurate mitigation strategies.

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Marketing Mix, Services and Branding

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Customer Awareness Towards Green Marketing Mix in 5-Star Hotels in Jordan

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Abstract This descriptive study determines the level of customers' and visitors' awareness regarding the green marketing mix activities and applications in green five-stars hotels in Jordan. The study population consisted of the visitors of 16 green

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_118

labeled five-stars hotels in Jordanian cities and tourism locations (Amman, Dead Sea, Petra and Aqaba). Non-random (purposive) sample was used to collect data and a structured questionnaire was distributed to (460) hotel customers, (412) of which were retrieved and (367) were valid for analysis with a response rate of (79.78%). A set of statistical methods were used through the (SPSS v23) program and results showed only two of the dimensions of green marketing mix had a high level of customer awareness. These dimensions were green product and green price. The overall level of customers' environmental concern was moderate along with the rest of the green marketing dimensions (promotion, place, process, people, and physical evidence). Based on results, it is recommended that hotel managers and marketers carefully design their business and marketing plans to truly develop credible green hotel image, avoid misrepresentation and green washing, and encourage customers to participate in protecting the environment.

Keywords Customer awareness · Green marketing mix · 5-star hotels · Jordan

1 Introduction

The vast development in the hospitality industry in recent years had a huge contribution to the environmental damage and global warming due to the massive amounts of water supply, energy, and natural resources consumed (Alshurideh et al., 2019; Leonidou et al., 2013). During this time, and specifically in the early 90's, an emerging movement for protecting the environment has developed. This movement forced the hotels managements shift their direction to this cause as an attempt to attract the novel segment of green customers and urge them into adopting a variety of green marketing activities (Joghee et al., 2021; Shishan et al., 2022; Tariq et al., 2022). The green marketing mix in hotels range from designing products that reduce emissions and hazards, altering the pricing strategies in exchange of the environmental commitment, developing online third-party partnerships to reduce transport pollution, expressing the hotel orientation through related marketing messages and promotions, providing appropriate training for employees, altering and redesigning the internal processes, and validating customer's expectations through physical evidence (Al-Hawary & Mohammad, 2011; Metabis & Al-Hawary, 2013).

The outcome of customers' awareness regarding a hotel's green marketing mix include influencing the buying behavior (Altarifi et al., 2015; Al-Hawary & Alhajri, 2020; Al-Nady et al., 2016), portraying a source of competitive advantage (Al-Hawary & Al-Hamwan, 2017; Al-Hawary & Ismael, 2010; Al-Hawary et al., 2011; Nadanyiova & Gajanova, 2018), affect the customers' willing to pay premium (Dimara et al., 2015) and increase customer loyalty (Al-Hawary & Al-Fassed, 2021; Al-Hawary & Al-Menhaly, 2016; Al-Hawary & Al-Smeran, 2017; Al-Hawary & Harahsheh, 2014; Al-Hawary & Hussien, 2017; Al-Hawary, 2013a, 2013b; Martinez, 2015).

This study discusses one of the most important issues at present. It fills a gap in giving precise measurements of using green marketing mix by hotels and the degree of customers' awareness of these practices. The study will provide guidance to hotels that need to develop new marketing mix practices for satisfying current customers and attracting new ones. It also explores the customers' needs and desires when they choose a hotel. And importantly, this research will educate hotels in deciding on whether this new approach (green marketing) is really fulfilling its purpose or not.

Given the importance of environmental protection, Green Hotels Association (GHA) made tremendous efforts to transform hotels into green entities. Not only providing extra positive publicity, but green marketing also helped increasing the competitive advantage, brand loyalty, and sustainable development. 5-star hotels begun leaning towards the green and sustainable trends and are most committed to the governmental regulations concerning energy and water conservation and proper waste management (Alketbi et al., 2020; Al-Quran et al., 2020).

This study identifies to hotels' managers and marketers the extent of customer awareness and knowledge of their hotels regarding the green hotel initiatives and consequently encourages marketers to develop successful green marketing strategies matching customers' requirements. This study examines the degree of customers' awareness of green marketing mix at the hotels in Jordan.

2 Theoretical Framework

2.1 Green Marketing Concept

When it comes to Green Marketing, the majority associate it with merely promoting or advertising the environmentally friendly products. The green marketing trend first began in the late '70 s when the Marketing Association of America conducted the first ecological-issues workshop. This workshop resulted in a book called "Ecological Marketing" by Heniun and Keny in 1979. These results weren't taken seriously until the late '80 s due to the growing movements to increase public awareness and urging customers to purchase green products. Later, the green marketing phenomena have gained distinctive importance in the modern market and have emerged in both developed and developing countries while being seen as a fundamental approach to aid sustainable development (Al-Hawary & Abu-Laimon, 2013; Al-Hawary & Aldaihani, 2016; Al-Hawary & Al-Syasneh, 2020; Al-Hawary, 2013a, 2013b; Alolayyan et al., 2018; Alshurideh et al., 2017a, 2017b; Lekhanya, 2014).

The relevant literature review showed a lack of sufficient research and the absence of a unique and defined definition. The American Marketing Association defined ecological marketing as studying both the positive and negative effects of pollution by carbon depletion and resources degradation by various marketing practices. Herbig and Butler (1993) defined green marketing as all products and associated packaging manufactured with criteria that are less toxic, durable, reusable and recyclable.

Then, green marketing was broadly defined by (Polonsky, 1994) who described green marketing as the practices intended to generate and facilitate human needs with a minimal harm to the environment. Later, Peattie (1995) defined green marketing as the holistic managerial process that distinguishes, predicts, and fulfils customer sustainable requirements. While the techniques used to promote products in terms of green marketing were described by Prakash (2002) as the use of ecological statements, either on the characteristics and features of the products or about the processes, policies, and systems of the companies that manufacture or sell these products. Jain and Kaur (2004) defined green marketing is all those marketing activities that companies undertake to create a positive impact or lessen the negative impact of their products or services on the environment. Chen and Chai (2010) stretched the definition of green marketing to include practices by companies that are apprehensive about environmental or green issues and are therefore selling products or services that are environmentally responsible to satisfy customers and society in general. Table 1 summarize the research papers used green marketing mix dimensions through their research.

Green products are percieved as valuable marketing tools, with many hoteliers attempting to offer green products that draw customer interest (Jones et al., 2014). Herberger first defined green products as products that have an ecological

Table 1 Green marketing mix dimensions (7Ps)

Authors	Year	Study title
Lapian & Tumbel	2018	Analysis of Green Marketing Mix Factors on Hotel Industry (Study on Sintesa Peninsula Hotel Manado; Discovery Kartika Plaza Denpasar; Hyatt Regency Yogyakarta; Grand Melia Jakarta)
Pomering,	2017	Marketing for sustainability: Extending the conceptualisation of the marketing mix to drive value for individuals and society at large
Eneizan & Wahab	2016	Effects of green marketing strategy on the financial and non-financial performance of firms: A conceptual paper
Kirimi Gitonga	2014	The influence of green marketing mix strategies on performance of fast-moving customer goods companies in Nairobi County. University of Nairobi
Kotler, Keller, Brady, Goodman & Hansen	2012	Marketing Management (2nd ed.)
Larashati	2012	7Ps of Green Marketing as Factors Influencing Willingness to Buy Towards Environmentally Friendly Beauty Products
Ivy	2008	A new higher education marketing mix: The 7Ps for MBA marketing

orientation, where its environmental viability is perceived, recognized, and understood. This definition was followed by many, but it rarely is a clear definition. Perhaps it was considered as a common term that is already well-known. For example, (Chen & Chai, 2010) simply defined green products as ecological product or environmental friendly product. A wildly mentioned definition is of who defined the green product development as greening the entire production process starting with the manufacturing phase and resulting in disposal. In their research, De Medeiros and Ribeiro (2017) proposed a different approach in defining green products. They suggested that sustainable products are those capable of reducing customer stress related to the environmental responsibility without affecting the overall product quality. In a green hotel context, we find customers also identify features, design, brand name, service quality, corporate image, and credibility before selecting a final hotel destination (Jones et al., 2014).

Green Price: The debate of whether green hotels charge premium or not is never ending due to its direct relation to whether customers are willing to pay extra or not. According to D'Souza et al. (2006) eco-friendly products should be expected to require premium charges in exchange. However, Yazdanifard and Mercy (2011) argue that premium green prices need to be reasonable and justifiable for customers. However, Roos and Nyrud (2008) contradict this argument as they mentioned that the green customers are less price sensitive that traditional customers. On the contrary, research indicates a link between willing to pay premium and the level of environment concern. Price was briefly defined by Engel et al. (2008) as the value offered in exchange of a product. It is considered the most critical dimension as most customers are only willing to pay additional value in exchange of additional product value and attributes. Such attributes might include improved performance, design, and visual appeal. Prakash (2002) stated that customers are not always ready to pay extra for green products. The author also mentioned that during inconvenience, customers perceive price as a huge barrier.

Green place plays a significant role in deciding the eco-friendly place channels for any green product. Rivera-Camino (2007) defined green place as the system that adheres to the green attributes of green products and ensures the environmental characteristics.

According to Eneizan et al. (2016) green place implies the method of selecting the place routes that result in a less environmental damage, since the majority of harm occurs during transportation. Green place highlights the importance of reducing the carbon footprint by rearranging and managing logistics and transportation emissions (Shil, 2012).

In order for green hoteliers to optimize their marketing efforts effectively, they need to decide where and how to position their place routs. It is therefore essential to place their place channels in the right place and time for the right target, which is the green customers (Kotler et al., 2012). It is no doubt that the internet is a powerful communication medium which is often utilized to educate the target market about the hotels' commitment to the cause and the operational sustainable practices. Websites are one wildly used media where a hotel can display all their credentials, awards, environmental programs, and policies. This allows hotelier to be directly in touch

with their customers to actively decrease the number of customers visiting the hotel or any related partner for more information.

Green promotion: Kamath et al. (2016) stated that green promotion refers to a type of advertising that promotes the organization's sustainable policies, their eco-friendly operations, and the environmental measures adopted. This involves developing the necessary promotional tools, such as advertising, marketing materials, signage, web sites, videos and presentations while remaining environmentally friendly (Al Kurdi & Alshurideh, 2021; Al-Dmour & Al-Shraideh, 2008; Alshurideh et al., 2016, 2018). According to Polonsky and Mintu (1997) green promotion helps customers to overcome the lack of environmental information. While Zint & Frederick suggested that customers are not to be assumed knowledgeable regarding the environmental damage and hazards. However, green promotion as explained by Ankit and Mayur (2013) and Alshurideh et al., (2017a, 2017b), might increase and satisfy the demand of green customers with environmental concerns.

Green process was defined as the methodology the service will be provided with minimum harm to the environment (Larashati, 2012). The author suggested greening the entire procedure line, if possible, to establish an overall green plan. Eneizan et al. (2016) argued that some changes to internal processes are expected by businesses who plan to implement green marketing as a business strategy. The company's processes might require some fundamental changes which can be achieved by using less energy, removing damaged products, and less destruction to the natural resources (Alsalaymeh, 2013). This can reflect sequential measures taken by a variety of different workers when seeking to fulfil a job which is incredibly important for the company objectives and procedures to comply. According to research, green process is determined based on possessing little to no potential in harming the environment starting with production, usage, and disposal. Green process should also contribute to saving non-renewable resources and energy. Lapian and Tumbel (2018) clarified that energy-efficient equipment involved in a hotel's operational procedures are of great necessity.

Green people: According to Larashati (2012), people are usually the employees of the company who contribute to both providing and marketing green services and products. It is also essential to possess a green mindset to reflect credibility in their duties. Sangeeta explains that when employees and management are aware of the probable damage to the environment and their role in minimizing this damage, the pro-environmental results and image are more visible. Involving the employees is more efficient and reduces the costs and expenses of the marketing efforts. In their research, Welmilla, and Ranasinghe (2020) explained that employees should be well educated on ecological issues, highly motivated and with a positive attitude, as the credibility of the company lies in their hands. **Green Physical Evidence**: According to (Pomering, 2017) green physical evidence is the environment where the service provided takes place and the customer-employee interaction occurs. Ivy (2008) explained that a potential overlapping between the physical evidence variable in the marketing mix and processes is possible. This strengthens the efforts of green hotels to convey their beliefs and persuades customers at the same time. The Chartered Institute of Marketing stated that the physical evidence provided by the

company will validate the customer's expectations. For example, the physical setting of the reception will display the hotel's green intentions in a desirable fashion. The space should be designed with elegant and innovative furniture, recycled materials, or reused products. The lobby should be equipped with digital reading materials instead of paper format to help hotel's customers read these digital materials via their computers or smartphones. Satisfaction and loyalty for a hotel could be highly improved by incorporating green physical evidence.

2.2 Customer Awareness

Despite its importance to governments, organizations, and scholars, customer awareness seems to be poorly discussed in a proper manner in literature. The term itself is usually misleadingly used in articles with vague discussions and definitions (Rhein & Schmid, 2020). The available literature typically associate customer awareness with either environmental concerns or customers purchase decisions amongst alternatives (Alshurideh, 2022; Alshurideh et al., 2020; Alzoubi et al., 2022). According to Hammami et al. (2017) these studies barely measure the environmental concerns and fail to capture the entire complete dimensions of the customer awareness. Regarding this study context, the last three decades witnessed a rise in customer awareness of the environment, as it has evolved from a secondary concern to a primary one. This has been the result of a variety of causes, including increasing media attention, growing knowledge of environmental issues, the rise of advocacy campaigns and strict regulation (national and international) and the influence of industrial incidents on public opinion (Abuhashesh et al., 2021; Alkitbi et al., 2020; Alshurideh, 2019).

The green customer is known to be someone whose actions are motivated by environmental issues. Peattie (2001) describes a green customer as anyone who willingly participates in environmentally sustainable practices approved by researchers. Critical customers have started to emerge as a new driver in green customers, requiring corporate social responsibility (Maheshwari, 2014). Gradually, the emergence of sustainable customer society has contributed to an ever-wider definition of consumption called ethical customers which refers to customer behaviour that expresses concerns about problems arising from illegal and discriminatory global trade (Hamelin et al., 2013). These behaviours might include abusing human rights, trafficking with animals, child labor, trade union repression, pollution, low-paid labour, and inequality in trade relations. When the mid 90's witnessed the advent of both the green customers and ethical customers, customers demanded an opinion in the manufacturing processes starting from production, place and even the resources allocation. Charter and Polonsky (2017) stated the anticipation of this ongoing disruption of customers, by advocating for sustainable marketing by academics. They also defined sustainability marketing as creation and preservation of a healthy relationship between customers and the environment (Charter & Polonsky, 2017). On the other hand, Rousseau and Venter (1995) defined the customer awareness as the customers' levels of alertness regarding their rights and their obligations in the marketplace.

This definition was further explained by five distinct forces as follows: bargain hunting, general customer knowledge, product knowledge, information search and price consciousness (Rousseau & Venter, 1996).

3 The Study Methodology

3.1 Study Population and Sample

The study population consisted of customers of 5-star hotels in Jordan to recognize their awareness toward green marketing mix in these hotels, where the number of hotels of this category reached 16 hotels in Jordan, most of them in Amman. Due to the large number of hotel customers, it was not possible to conduct a complete census of all customers, so the non-random (purposive) sample was used to collect data related to the study. The study instrument was distributed to (460) hotel customers to achieve the appropriate response rate. A retrieved questionnaire (412) where it was found that (45) were not suitable for statistical analysis due to its incompleteness or the similarity of the answers. Consequently, the analyzed questionnaires were (367) which constitutes a response percentage (79.78%) of the distributed questionnaires.

3.2 Study Instrument

The questionnaire was used as a basic instrument to collect data from the target study sample, where this questionnaire consisted of two parts, the first part contains an introductory introduction about the nature of the study as well as questions related to demographic variables (gender, age, educational level, and familiar with the study variables). The second part, it consists of (50) items related to the variable represented by the customers' awareness of green marketing mix, which was developed based on appendix (3). This variable is formed by eight dimensions that were: general environmental concern which was measured by items (Q1–Q9), green product which was measured by items (Q10–Q16), green prices which was measured by items (Q17–Q22), green promotion which was measured by items (Q23–Q29), green place which was measured by items (Q30–Q33), green process which was measured by items (Q34–Q39), green people which was measured by items (Q40–Q44), green physical evidence which was measured by items (Q45–Q50).

3.3 Validity and Reliability

To verify of face validity of the study instrument and its suitability for conducting the study, the tool was presented to a number of referees from the academic doctors in order to identify the belonging of the items to their latent variables and their good linguistic formulation. In addition, the exploratory factor analysis (EFA) was used as a statistical method used to identify the validity and reliability of the instrument through the values of the average variance extracted (AVE) to test the convergent validity, and compared the values of the average variance extracted (AVE) with the maximum shared variance (MSV) to test the discriminate validity. Moreover, the reliability of the instrument was tested using McDonald's Omega coefficient (C.R) to evaluate composite reliability of the study instrument. The results of these tests are presented in Table 2.

The results in Table 2 showed that the values of items loadings on their latent variables ranged between (0.681–0.769) which was greater than the lowest acceptable value of 0.50 (Al-Hawary et al., 2018; Haig, 2018), and the values of the average variance extracted (AVE) within the ambit (0.507–0.558) which were higher than the minimum threshold for judging convergent validity (Howard, 2018). In addition, the obtained average variance extracted (AVE) were greater than the values of maximum shared variance (MSV), which indicates the achievement of the discriminate validity. In terms of reliability, the results listed in the table (1) showed that the values of McDonald's Omega coefficients (C.R) ranged between (0.813–0.905) that were higher than 0.70 which is the minimum acceptable value for the composite stability (Heale & Twycross, 2015).

4 Data Analysis

4.1 Correlation

Table 3 shows the results of Pearson's correlation matrix to exhibit the relationship between the study variables and ensuring that the data free of a multicollinearity problem.

Through the results shown in Table 3 that that the study variables are related to each other, where the values of the correlation coefficients within the range (0.126–0.650) and they were all statistically significant at a significance level less than 0.05. Furthermore, the results show that the data is free from the problem of multicollinearity where the correlation coefficients values were less than 0.80 (Senaviratna & Cooray, 2019).

Table 2 Results of a measurement model validity and reliability

Variables	Items	Loadings	AVE	MSV	C.R
General environmental concern	Q1	0.708	0.514	0.502	0.905
	Q2	0.725			
	Q3	0.716			
	Q4	0.707			
	Q5	0.748			
	Q6	0.706			
	Q7	0.693			
	Q8	0.689			
	Q9	0.757			
Green product	Q10	0.751	0.542	0.470	0.881
	Q11	0.698			
	Q12	0.681			
	Q13	0.731			
	Q14	0.725			
	Q15	0.686			
	Q16	0.743			
Green prices	Q17	0.734	0.521	0.492	0.867
	Q18	0.702			
	Q19	0.721			
	Q20	0.725			
	Q21	0.687			
	Q22	0.760			
Green promotion	Q23	0.708	0.511	0.180	0.880
	Q24	0.703			
	Q25	0.694			
	Q26	0.697			
	Q27	0.755			
	Q28	0.724			
	Q29	0.723			
Green place	Q30	0.700	0.521	0.154	0.813
	Q31	0.696			
	Q32	0.733			
	Q33	0.755			
Green process	Q34	0.769	0.558	0.302	0.883
	Q35	0.748			
	Q36	0.721			

(continued)

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Table 2 (continued)

Variables	Items	Loadings	AVE	MSV	C.R
	Q37	0.735			
	Q38	0.754			
	Q39	0.758			
Green people	Q40	0.725	0.531	0.163	0.850
	Q41	0.700			
	Q42	0.724			
	Q43	0.733			
	Q44	0.760			
Green physical evidence	Q45	0.721	0.507	0.110	0.860
	Q46	0.690			
	Q47	0.756			
	Q48	0.708			
	Q49	0.686			
	Q50	0.707			

Table 3 Results of Pearson's correlation matrix

Variables	1	2	3	4	5	6	7	8
1. General environmental concern	1							
2. Green product	0.608**	1						
3. Green prices	0.650**	0.365**	1					
4. Green promotion	0.378**	0.219**	0.262**	1				
5. Green place	0.332**	0.221**	0.301**	0.169*	1			
6. Green process	0.490**	0.376**	0.379**	0.222**	0.230**	1		
7. Green people	0.352**	0.226**	0.336**	0.141**	0.126*	0.190**	1	
8. Green physical evidence	0.288**	0.266**	0.190**	0.145**	0.156*	0.179*	0.216**	1

Note *Correlation is significant at the 0.05 level, **Correlation is significant at the 0.01 level

4.2 Descriptive Statistics

This section is providing a detailed presentation of data analysis that was collected through the study instrument, which was distributed to the study sample, as well as it also answers to the study questions and achieving its objectives. Table 4 displays the results of means and standard deviations used to answer the major question that was "What is the level of customers' awareness toward green marketing mix in the five stars hotels in Jordan?"

Table 4 Results of statistics related to green marketing mix

Dimensions	Means	SD	Rank	Level
Green prices	3.74	0.589	1	High
Green product	3.68	0.565	2	High
Green people	3.65	0.615	3	Moderate
General environmental concern	3.57	0.552	4	Moderate
Green physical evidence	3.56	0.574	5	Moderate
Green promotion	3.56	0.566	6	Moderate
Green process	3.55	0.629	7	Moderate
Green place	3.54	0.621	8	Moderate
Green marketing mix	3.61	0.352	–	Moderate

The results in Table 4 indicate that means of the responses of the study sample ranged between (3.54–3.74) with standard deviations between (0.552–0.629). These results referred that the relative importance of green marketing mix dimensions ranged between high and moderate level, where the dimension of green prices came in first rank with a mean (3.74) with a standard deviation (0.589), where it indicates to a high level, followed by the dimension of green product with a mean (3.68) with a standard deviation (0.565) that was refereed also to a high level, while the dimension of green place ranked in the last place with a mean (3.54) with a standard deviation (0.621) which was at a moderate level. Moreover, the results demonstrated that customers' awareness toward green marketing mix in the five stars hotels in Jordan was at a moderate level, where mean was (3.61) with a standard deviation (0.352). Besides, one sample t-test was conducted on the study instrument related to customers' awareness toward green marketing mix in the five stars hotels in Jordan by assuming the hypothetical mean is 3, where the table 5 shows the results obtained.

The results in Table 5 indicated that the calculated t value was (32.930) at a significance level (0.000) which was less than 0.05. Therefore, customers' awareness toward green marketing mix in the five stars hotels in Jordan was at a moderate level and has a statistically significant. One sample t-test was conducted on the study instrument related to customers' awareness toward each dimension of green marketing mix in the five stars hotels in Jordan by assuming the hypothetical mean is 3, where the Table 6 shows the results obtained.

Based on the calculated t value and the significance level which were for all less than 0.05. Therefore, the customers' awareness toward green product, Green Promotion, Green Place, Green Process, Green People, general environmental concern and

Table 5 Results of one-sample t test for green marketing mix

Variable	Mean	SD	t-value	df	P-value*
Green marketing mix	3.61	0.352	32.930	366	0.000

Note *Refers to a significance level ($P \leq 0.05$)

Table 6 Results of one-sample t test for green product

Variable	Mean	SD	t-value	df	P-value*
Green product	3.68	0.565	22.977	366	0.000
Green prices	3.74	0.589	24.042	366	0.000
Green promotion	3.55	0.566	18.905	366	0.000
Green place	3.54	0.621	16.571	366	0.000
Green process	3.55	0.629	16.809	366	0.000
Green people	3.65	0.615	20.350	366	0.000
Green physical evidence	3.56	0.574	18.767	366	0.000
General environmental concern	3.57	0.552	19.652	366	0.000

Note *Refers to a significance level ($P \leq 0.05$)

Green Physical Evidence in the five stars hotels in Jordan was at a high level and has a statistically significant, while customers' awareness toward green prices in the five stars hotels in Jordan was at a high level and has a statistically significant.

5 Discussion, Conclusion and Recommendations

5.1 Results Discussion

Based on the statistical results, it was found that the Jordanian green hotels' customers have mixed beliefs when it comes to green hotels' practices as only (56.40%) of the study sample stated that they were familiar with these practices. When compared to the general environmental concern part of the questionnaire, obtained data showed moderate levels of awareness. According to literature, these two factors are positively engaged and are highly related to each other, as the higher the environmental concern the higher the level of familiarity of green practices. In order for hotel managers and marketers to benefit from the positive publicity, competitive advantage and brand loyalty, they need to identify the level of customers awareness not only regarding the environmental conservation but also the green hotel marketing mix. This helps them to better elevate or promote their efforts to their guests and also measure the effectiveness of these efforts.

According to this study, we have been able to answer this question by identifying the level of green marketing mix awareness and found it was moderate. This would consequently encourage marketers to develop successful green marketing strategies to match their customers' requirements and needs. This result was based on measuring the sub questions of green marketing mix dimensions which include (product, price, place, promotion, process, people, and physical evidence).

Findings related to these questions clearly show that the level of customers' awareness regarding prices was the highest. Respondents stated that they were willing to

pay extra to green hotels especially if it was helping reducing pollution and being invested in eco-services. Price is also incredibly important to hoteliers as it provides insights regarding the competitive advantage and sufficient revenue. Green hotel managers will need to coordinate the prices they charge their customers with the additional costs associated to green technologies, processes, and promotion.

The second green marketing dimension to rank high in this study was green products. Respondents showed high interest in using eco-friendly products, expressing their understanding of the environmental phrases, symbols, and green claims. Respondents also stated that they enjoy environmentally friendly products and healthy amenities provided by green hotels. As the second most important dimension to customers, hoteliers need to constantly provide authentic green products along with environmentally friendly facilities to please customers and emphasize differentiation.

The remaining green marketing mix dimensions showed similar moderate awareness level results. According to questionnaire respondents, hotels usually fail to make their green promotions noticeable by clients and they expect to be informed regarding the hotel's green activities. The respondents also stated that when they are educated regarding the hotel's green policies, they will advise their friends and families to visit such hotels. As customers are probably suspicious regarding hotels honest eco-claims. Promotion plays a huge role in translating the hoteliers' efforts in conserving the environment. Promotion further aids customers in easily finding green hotels, their products, and facilities without wasting money, time and efforts.

Like promotion, green place dimension also plays a role when it comes to convenience. According to respondents, the hotel location needs to be in alignment to the green claims. Online booking services are usually preferred by customers as it provides all the information required regarding staying at a green hotel. Partners and vendors are required to have sufficient information regarding the greenness of a hotel as it helps maintain the hotel brand image.

As stated above, the green process showed moderate awareness levels amongst respondents. They were able to acknowledge that their hotels implement e-commerce to preserve the environment. They expressed that paperless interactions and water preservation are visible and effective approaches. Literature states that green processes can highly improve the financial performance. Eco-equipment and technology -although somewhat expensive- ultimately prove efficient in reducing cost as it reduces the overall natural resources consumption and effectively reduces the associated waste.

Green hotels' employees are a major asset to the hotel management as they are the frontline with customers. According to hotels' customers, having well trained employees who are ready to answer inquiries regarding green products, services, facilities, process or even green activities is of importance. Approaching these customers with positive and motivational green attitude is also recommended.

And finally, the green physical evidence translates all the above without human–human interaction. Green buildings are not only an architectural trend, but it also helps expressing the level of hotel greenness. Placing digital or recyclable green materials

is preferable by customers. The general atmosphere, furniture and accessories should also reflect the nature and the eco-friendly efforts by hoteliers.

5.2 Conclusion

Looking back to literature, we can notice the majority highlighting the importance of customer concern towards the environment and the impact of customer awareness of the hotel green marketing mix on several behaviours ranging from attitude, purchase intention and word of mouth.

Based on the above discussion, we can confidently claim that the possibility of having more environmentally friendly hotels with better service quality and benefits as the customer general environment concern and awareness grow. Even though the respondents were not able to prove they fully understand the green marketing mix implications, but the overall idea of the concept shows a certain level of awareness. Naturally, we can't emphasise more the importance of reducing customer doubt and the potential mistrust of the green hotels as it increases the susceptibility of damaging the brand image by constantly promoting real actions and strategies while providing the sufficient training for the staff.

In conclusion, many hotels have begun to transform their objectives into greener ones to attract new customer segments and generate revenue. It is also essential to correctly promote these objectives and practices to increase the customer awareness and motivate purchase decisions. Hoteliers are also advised not to take advantage of the customers' confusion regarding the hotel's environmental claims and to righteously explain these claims to eliminate green washing. Developing guides signage to self-explain the ecological terms and claims might prove beneficial. This might be implemented after examining the hotel's surrounding environment (nature), the workflow processes and policies, the technology and innovation in accordance with natural resources, renewable energy and waste management.

As a growing concept in Jordan, green marketing is gaining a shy popularity in the hospitality industry as several hotels are adopting the concept with minimal efforts of promotions and advertisements as a source of gaining the knowledge and increasing the customers awareness. Making the hotels practices more visible to the public benefits the hotels, customers and finally the environment.

5.3 Marketing Practical Implications and Recommendations

Based on all of the above, we can positively state that the interest in green hotels will grow in the near future. In this study, specific recommendations and measures are suggested for an efficient and effective green policy implementation in the hotel sector in Jordan:

1. Hotel managers and marketers are suggested to carefully design their business and marketing plans to truly develop credible green hotel image and avoid misrepresentation. In addition, acquiring international green awards and accreditation enhances customers' trust and confidence regarding the hotels' green products and services, increase loyalty, and differentiates hotels by achieving a competitive advantage.
2. The utilization of a holistic sustainable framework in hotels results in higher efficiency in operations. For instance, improved efficiency in the use of energy and natural resources results in substantial cost savings, and a better waste management system will not only reduce the amount of waste but will also ensure its safe disposal.
3. The main purpose of green products is to provide benefit and value without harming the environment. Green hotels are suggested to alter their hotel equipment in rooms and hotel amenities into more efficiently energy conservative equipment and minimize waste. They can also provide organic food at restaurants and source from local markets, present ecological cleaning products with less plastic and distribute garbage separating bins.
4. Hotels can implement a new promotional and branding strategy while protecting the environment by providing branded reusable water bottles to their guests and placing water-filling stations throughout the hotel. They can also involve the local community and surrounding environment in the promotional ad campaigns, events and celebrations to encourage customers to make local purchases from vendors, promote tourism and benefit the community.
5. Digital marketing plays a major role nowadays. Incorporating social media, websites and online booking reduces the amount of paper consumed by both the hotel staff and the hotel customers and helps customers be closer to the information they require prior their arrival which eventually helps reduce the carbon footprint.
6. For customers to pay premium prices at green hotels they need to perceive great value in exchange. Hotels are advised to keep hotel guests happy, satisfied and actively engaged in the sustainable practices provided. Conducting interactive workshops, activities and minigames attracts more customers and satisfies the existing ones.
7. Hotel staff play a major role in providing necessary information regarding environment preservation and hotel procedures to their guests. Frequently providing the required relevant training is highly recommended as it reflects in their day-to-day work activities. Sufficient training also gives the staff confidence in responding to customers regarding the green hotel practices without the need to consult with the management.
8. The physical environment also plays a major role in translating sustainability. Wood furniture, greenery sights, natural aromas are some of the first interactions with hotel customers. Consulting with architects and interior designers to reflect the sustainability in hotels will prove beneficial on the long run.

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Customers' Perception of the Social Responsibility in the Private Hospitals in Greater Amman

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Abstract The study determines the level of patients' and visitors' perception of social responsibility in private hospitals in Greater Amman. The population of the study consisted of all patients and visitors of private hospitals in Greater Amman.

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_119

The sample of the study consisted of patients and visitors of three private hospitals (Jordan Hospital, Istishari Hospital, AlKhalidi Hospital),100 patients and visitors from each hospital, the total number of patients and visitors are three hundred. Those patients and visitors are randomly selected, three hundred questionnaires were distributed by hand, out of them 210 questionnaires are returned complete with a response rate of 70%. This study identifies to managers and decision-makers in private hospitals that to which extent the patients and visitors of private hospitals perceive their social responsibility programs and consequently encourages them to develop successful social responsibility programs which compatible with customer's perceptions and preferences. The results show that all dimensions of social responsibility are moderately perceived by patients and visitors of private hospitals in Greater Amman.

Keywords Social responsibility · Private hospital · Customers' perception · Amman

1 Introduction

The healthcare sector has a variety of challenges such as stringent regulatory compliance, intense labor shortages in nursing, increased and costly technological advancements, implementation of international quality standards, and substantial community dependence (Al-Hawary, 2012; Al-Hawary et al., 2011; Abu Qaaud et al., 2011; Al-Hawary et al., 2011; Al-Hawary et al., 2017; Al-Hawary & Al-Namlan, 2018; Mohammad et al., 2020). Corporate social responsibility could play a major role in this context that's why hospitals with the mission of providing medical services, should engage in social responsibility programs effectively (Al-Hawary & Al-Khazaleh, 2020; Alhalalmeh et al., 2020; Abu Zayyad et al., 2021).

Social responsibility programs in hospitals range from voluntary programs and partnerships to mitigate the environmental impact of industrial plants and production methods to the development of sourcing and marketing initiatives that protect social welfare and commit to environmental benefits (Alshurideh et al. 2016, 2019a, b). In turn, the outcomes of social responsibility programs include achieving competitive advantage (Sen et al., 2006), gauging corporate reputation (Ellen et al., 2006), positive corporate financial outcomes and increased market value (Peloza & Shang, 2011), and increased willing to pay premium (Parsa et al., 2015; Alshurideh et al., 2021).

This study discusses one of the most important issues at present. The importance raised by many factors which are: evolved new concerns and expectations of citizens, customers, public authorities, and investors about corporate social responsibility, increased concerns about the harm caused by economic practices to the environment, and transparency of business activities brought by the media and modern information and communication technologies (Almazrouei et al., 2020; Aljumah et al., 2021; Al-Maroof et al., 2021; Khasawneh et al., 2021a, 2021b; Kurdi et al., 2021; Shamout et al., 2022; Vallaster et al., 2012). With a view to those factors, service providers are

allocating significant resources to manifest their commitment, as well as their ethical vision and socially responsible behavior. The first main objective is determining the patients' and visitors' perception of social responsibility dimensions in private hospitals in Greater Amman.

2 Theoretical Framework

2.1 Social Responsibility

There have been different definitions of social responsibility offered in the literature which represents different conceptualizations (Maignan & Ferrell, 2004). The social responsibility has emerged as a key concept in the management, ethical, marketing, and communication literatures (AlShehhi et al., 2020; Alshurideh et al., 2017; Alyammahi et al., 2020; Zadek, 2006). Bolton and Mattila (2015) defined corporate social responsibility as "a company's commitment to minimizing or eliminating any harmful effects and maximizing its long-run beneficial impact on society". Chen (2016) defined corporate social responsibility as "the extent to which the social responsibility actions contribute to customers' perceptions on corporate social responsibility commitment, values-driven motives, customer orientation, and trustworthiness".

Jin et al. (2017) defined social responsibility as "the responsibility of an organization for the impacts of its decisions and activities on society and the environment, through transparent and ethical behavior that contributes to sustainable development including the health and the welfare of society, takes into account the expectations of stakeholders, is in compliance with applicable law and consistent with international norms of behavior, and is integrated throughout the organization and practiced in its relationships". Finally, Schwartz and Carroll (2018) defined social responsibility by three domain approach which presents in three core domains of social responsibility: economic, legal, and ethical responsibilities.

In literatures social responsibility examined as multi-dimensional, where its initiatives vary from voluntary programs and partnerships to mitigate the environmental impact of industrial plants and production methods to the development of initiatives which protect social welfare and commit to environmental benefits. This study will discuss six dimensions of social responsibility as follows:

- **Economic Responsibility**: Bello et al. (2016) defines economic responsibility as corporate responsibility to make decisions that will enhance the shareholders' wealth and found jobs with fair wages, while at the same time, producing quality products that are needed and desired by customers and also sell those products at a reasonable price. Moreover, Schwartz and Carroll (2018) in three domain approach embraces two types of economic activities direct and indirect. Direct economic activities include actions intended to increase sales or avoid litigation. Indirect economic activities include activities that are designed

to improve employees' morals or the company's public image (Al-Jarrah et al., 2012; Al-Gasaymeh et al., 2015, 2020; Assad and Alshurideh, 2020a, 2020b).

- **Legal Responsibility**: Bello et al. (2016) defined legal responsibility as the responsibility of the company to operate within the laws, rules and regulations set down by recognized institutions in the society. Schwartz and Carroll (2018) in three domain approach explain that "the legal category of corporate social responsibility relates to the corporate response to legal anticipations imposed and expected by society as emerged in case law".
- **Ethical Responsibility**: The ethical dimension of social responsibility encompasses those activities that are based on their adherence to a set of ethical or moral standards or principles. Interestingly, Nussbaum (2009) mentioned ethical corporate social responsibility activities as follow: publish a detailed (annual report) on the CSR activities of its members, partnerships between locals' investments in awareness campaign, proactively go beyond what is only the legal thing to do, sticking to the core business of life-threatening diseases (support patient associations), and not giving up business ethics for commercial purposes.
- **Philanthropic Responsibility**: Corporate philanthropy is no longer a simple matter of donating money to a deserving cause. It is increasingly expected to serve long term business interests (Alshurideh et al., 2014; Rampal & Bawa, 2008). Accordingly, Peloza and Shang (2011) mentioned different types of philanthropic activities as follow cause-related marketing (where a charity donation is attached to a commercial exchange), donations of cash (different from cause-related marketing because donations are not attached to a sale), statements of support for charities without stating explicitly how that support is given, promotion of a social issue, donations of products, licensing, event sponsorship, customer donations and non-specific support for charities and employee volunteerism.
- **Environmental Contribution**: The environmental activities or green activities focus on firm activities that do not corrode natural resources through corporate environmental responsibility. Parsa et al. (2015) identified different types of environmental practices as follows: incorporating product features that are environmentally friendly (green products), minimizing waste (recycling program), energy conservation (power and water conservation), reduction of pollutants (reduction of fluorocarbons and Styrofoam), and good-neighbor activities such as (neighborhood clean- up).
- **Customer Protection**: Customers are noted to be the main stakeholder group whose continuous protection is essential for the continuance of business. The customers also have notable interactions with corporations on a consistent basis and this leads to raising the possibilities for potential conflicts between the two parties, especially on the issues relating to non-observance of customers' rights by the corporation's (Al-Hawary & Hussien, 2017; Al-Hawary & Obiadat, 2021; Alolayyan et al., 2018). Thus, issues relating to corporate social responsibility and customer protection have remained contemporary topics in the marketing literature (Bello et al., 2016). Sun and price (2016) mentioned stakeholder theory which argues that corporate social responsibility contributes to customer satisfaction by establishing customer relationships and meeting customer needs.

2.2 Customer Perception

It is important to differentiate between customers' expectations of social responsibility and customers' perceptions of social responsibility. Golob et al. (2008) found that customers have high expectations of corporate social responsibility, especially in the legal and ethical-philanthropic domains. Moreover, expectations for the ethical-philanthropic dimension of CSR are higher amongst customers holding high self-transcendent values and practicing high involvement. Gleim (2011) represented that the environmental sustainability is becoming increasingly important to customers, it is critical that firms understand the role that it can have with regards to perceptions of the firm.

JIN et al. (2017) examined the effect of corporate social responsibility on customer behavior and found significant differences in brand attitude and perception of credibility when companies did not engage in corporate social responsibility activities. Su et al. (2017) found that corporate social responsibility positively affects perceived corporate reputation and customer satisfaction, which in turn, significantly affects customer commitment and behavioral responses (i.e., loyalty intentions and word-of-mouth) (Alzoubi et al., 2020; Sweiss et al., 2021).

3 Study Methodology

3.1 Population and Sample of the Study

The population of the study consisted of all patients and visitors of private hospitals in Greater Amman. The sample of the study was selected from patients and visitors of three private hospitals (Jordan Hospital, Istishari Hospital, AlKhalidi Hospital), 100 patients and visitors from each hospital. the total number of study participants are 300 individuals. Those participants are randomly selected.

4 Data Analysis

4.1 Exploratory Factor Analysis (EFA)

To verify the psychometric properties of the questionnaire, an exploratory factor analysis (EFA) was conducted. Table 1 shows the rotation matrix for the items of the questionnaire.

The results in Table 1 show that the factor loadings of all items are ranged from (0.734) to (0.941). Factor loadings greater than (0.4) were identified as acceptable. Factorability of questionnaire items was identified based on KMO (KMO = 0.686,

Table 1 Results of exploratory factor analysis

Items	Factors					
	1	2	3	4	5	6
1	0.852					
2	0.845					
3	0.888					
4	0.842					
5	0.91					
6	0.734					
7		0.865				
8		0.852				
9		0.921				
10		0.742				
11			0.924			
12			0.854			
13			0.889			
14			0.778			
15				0.931		
16				0.852		
17				0.863		
18				0.859		
19				0.738		
20					0.941	
21					0.854	
22					0.821	
23					0.886	
24					0.773	
25						0.854
26						0.894
27						0.932
28						0.784
29						0.852
30						0.861
31						0.841
32						0.863
33						0.766

Determinant = 0.005, KMO = 0.686, Bartlett's Test significant at $\alpha \leq 0.05$

greater than 0.05) and Bartlett's Test (Significant at $\alpha \leq 0.05$). The table illustrates that the items of the questionnaire were loaded on six factors: Factor 1 (6 items), factor 2 (4 items), factor 3 (4 items), factor 4 (5 items), factor 5 (5 items) and factor 6 (9 items).

4.2 Confirmatory Factor Analysis (CFA)

In order to examine the goodness-of-fit of the measurement model, confirmatory factor analysis (CFA) was used. The results in Fig. 1 show that the goodness-of-fit of the measurement model is adequate (Chi-square = 1.778 < 2.0, GFI = 0.933 > 0.90, CFI = 0.917 > 0.90 and RMSEA = 0.068 < 0.08).

4.3 Testing Validity and Reliability

In order to validate the research instrument, the researchers have presented the questionnaire to panel composed of marketing professors. Each of them on read and / or contributed to the instrument to ensure the questions were representative of the purpose of the study. Based on the feedback provided, the researcher made the necessary modifications to the newly developed instrument, including editing the content and order of the survey instrument. After they have confirmed the instruments in Arabic language, it was distributed to a sample of (10) patients and visitors to ensure it is understandable and easy to read.

Reliability is defined as "the degree to which majors are free from error and therefore yield consistent roles". The researcher used Petrick test, which is an indicator of consistency that is believed to determine the correlations between the items of the scales from which the questionnaire has been composed. The scale is considered reliable when it has Petrick test (Composite Reliability) of (≥ 0.70). For the purpose of this study, researcher used SPSS package to determine Petrick test (Composite Reliability) for the scale questions. The results in Table 2 confirm that the study tool is reliable to be used for data collection.

As the data presented in Table 2, the scale is reliable and set of items are closely related to a group.

5 Data Analysis

To test this hypothesis, descriptive statistics means and standard deviations were used in measuring the customers' perception of social responsibility and its dimensions.

Table 3 shows the means scores for the total perceived social responsibility and its dimensions.

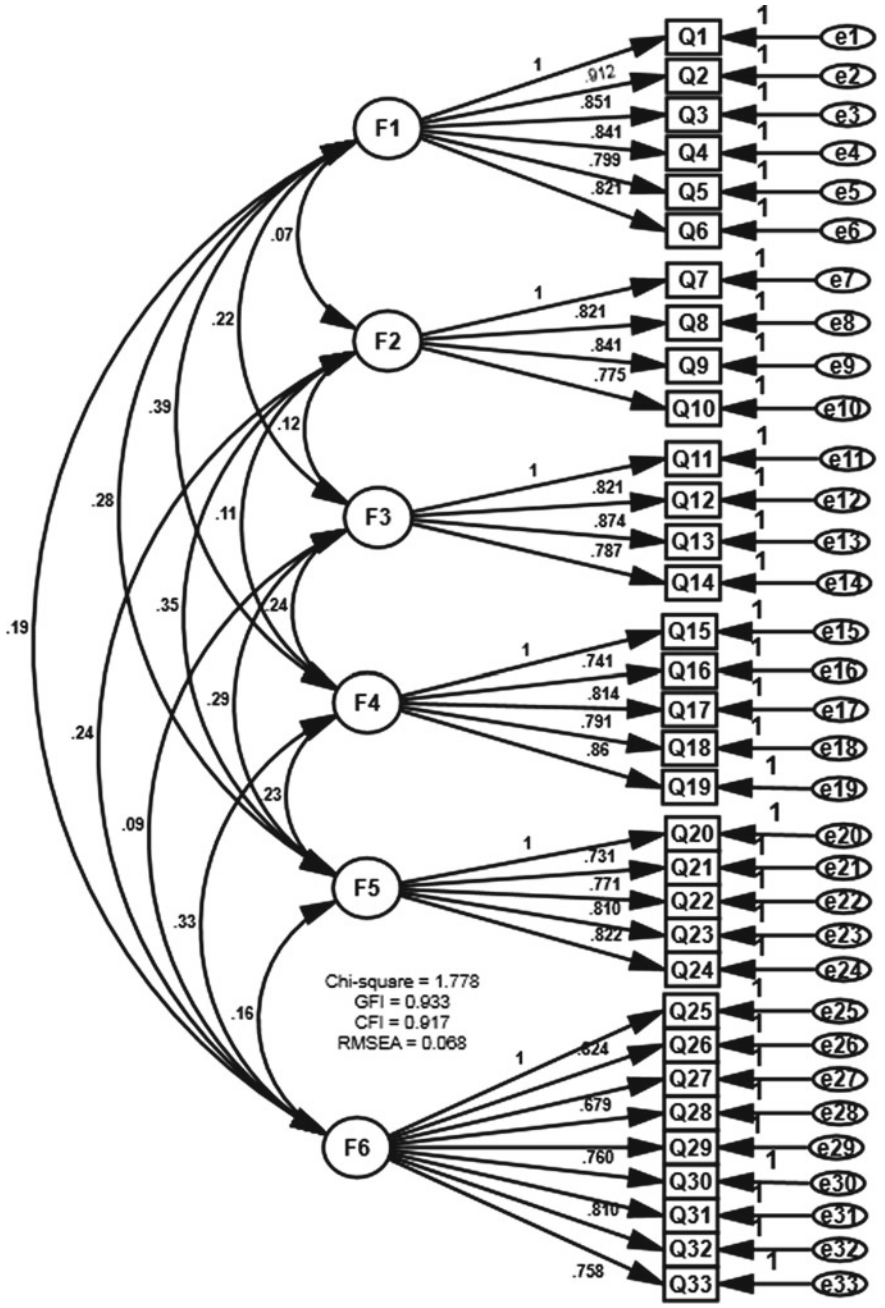

Fig. 1 Results of CFA of social responsibility items

Table 2 Results of validity and reliability test (Petrick test)

Dimensions	Reliability
	Petrick test (composite reliability)
Philanthropic responsibility	0.938
Ethical responsibility	0.910
Legal responsibility	0.921
Economic responsibility	0.929
Environmental contribution	0.932
Customer protection	0.959

Table 3 Mean and standard deviations of social responsibility dimensions

Dimensions	Mean	Std. deviation	t-value	P-value
Philanthropic responsibility	2.79	0.74	14.03	0.000
Ethical responsibility	3.53	0.61	12.42	0.000
Legal responsibility	3.59	0.65	13.12	0.000
Economic responsibility	3.58	0.56	14.89	0.000
Environmental contribution	3.39	0.56	10.15	0.000
Customer protection	3.54	0.59	13.29	0.000
Grand mean	3.40	Moderate		

In order to measure the customers' perception of social responsibility in the private hospitals in Greater Amman, the grand mean (3.40) was matched with the statistical rational formula and it was found that it is in the second category (2.34—less than 3.68), which means that the level of customers' perception of social responsibility in the private hospitals in Greater Amman is moderate.

6 Conclusion and Discussion

The private sector is gaining a much bigger role and responsibility for economic development globally. This responsibility is not limited to economic issues but must also include social and environmental contribution. Hospitals that fail to recognize this responsibility are at the risk of being denied the social acceptance that comes from the community. Without this acceptance, hospitals can never function in a profitable and sustainable manner. Utilization of a holistic corporate social responsibility framework in hospitals can result in higher efficiency in operations, for instance, improved efficiency in the use of energy and natural resources can result in substantial cost savings. A better waste management system will not only reduce the amount of waste but will also ensure its safe disposal.

Reputational risk is considered as one of the most crucial threats facing an organization and is even more critical for a hospital. This includes risks not only to loss of patients, but goes beyond to hospital itself, and may even impact the whole industry. In case of a reputational crisis involving the hospital, the consequences could be huge in terms of lost trust, legal costs and patient loyalty. A damaged reputation might require years to rebuild and cost a large sum of money. A hospital which has a sound corporate social responsibility mechanism and a history of exceptional service to society and environment often does not suffer as much as a hospital with no corporate social responsibility plans, in the incidence of a reputation crisis.

Patients need to be able to trust a hospital in order to recommend it to someone. Trust is probably the most valuable currency in the healthcare industry and it doesn't come easy. In order for hospitals to earn patient trust and loyalty, they need to go beyond healthcare services and create an emotional bond with the patient through ethical business practices. Patient loyalty goes a long way in contributing towards sustainable business growth of a hospital. When competitors adopt less costly but not socially responsible and ethically sound healthcare solutions, a hospital should take advantage of this challenge and explore new innovative and green solutions. This raises the barriers to entry and will make CSR as the industry norm with your company being the pioneer.

Investors no more only rely on financial data but also look at how a company deals with the relevant social and environmental issues. If a company is not prudent enough to pay any attention to these issues, with time it will lose credibility and no investor wants to invest in a company that has no credibility or stakeholder trust. In order for a healthcare service provider to attract investors who can fund their expansion, they need to focus on social, environmental and economic performance in addition to financial performance.

Appendix 1

See Table 4.

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Table 4 Social responsibility dimensions

Author/year	Social responsibility dimensions
Carroll (1991)	(a) Economic—making a profit, (b) Legal—obeying the law and following government regulations, (c) Ethical—doing what is right and avoiding harm, and (d) Philanthropic—contributing resources to the community to improve the quality of life
Chattananon et al. (2007)	Social responsibility Programs: program symbolism (visual symbolism and other tangibles), behavior (management behavior, employees' behavior and other intangibles), program communications (primary, secondary and tertiary communications)
Golob et al. (2008)	Economic, Legal, Ethical, and Philanthropic
Swaen and Chumpitaz (2008)	Philanthropic activities, Respect for the environment, Respect for customers, Respect for workers
Peloza and Shang (2011)	Philanthropy, Business practices, Product related
Chabowski et al. (2011)	Environmental dimension, Social dimension, Economic dimension
Smith and Langford (2011)	Ethical CSR, Economic CSR, Philanthropic CSR, Legal CSR, Social responsibility, and Environmental responsibility
Vallaster et al. (2012)	CSR entrepreneurs, CSR performers, and vocal CSR converts or quietly conscientious
Blagov and Savchenko (2012)	Philanthropic activities: corporate donations in money; corporate donations in kind; rendering services; employees' donations; and corporate sponsorship
Lombart and Louis (2014)	Respect for the environment, Respect for customers, and Philanthropic activities put in place
Garcia and Greenwood (2015)	Environmental sustainability, Quality products and Services, Financial sustainability, Ethics, Philanthropy, Employee welfare, and Legal responsibility
Parsa et al. (2015)	Nutritional concerns, Environmental concerns, Social concerns

(continued)

Table 4 (continued)

Author/year	Social responsibility dimensions
Bolton and Mattila (2015)	Corporate Philanthropy, and Sustainability
Garcia and Greenwood (2015)	Environmental sustainability
Santhosh and Baral (2015)	Social Responsibility Towards Employees: Sound policies and practices, employee participation in decision making, equity in employee remuneration, good working conditions, elimination of child labor, avoidance of gender bias Social Responsibility Towards Customers: Practicing ethical advertising, adhering to product standards, prioritizing customer health and safety, and providing products at right price Social Responsibility Towards Community: Building schools, hospitals, temples, etc Social Responsibility Towards Environment: Adhere to environmental standards
Chen (2016)	Cause donation, Cause sponsorship, Social alliance, and Value-chain social responsibility
Bello et al. (2016)	Economic, Legal, Ethical, and Philanthropic
Su et al. (2017)	Conserve the natural and cultural resources, and Boost the local economy by hiring the local residents and bringing jobs to the region
Jin et al. (2017)	Donations, Employee volunteering, and Nonperformance of CSR
Schwartz and Carroll (2018)	Legal domain, Ethical Domain, Economic domain

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The Impact of Brand Loyalty Determinants on the Tourists' Choice of Five Stars Hotels in Jordan

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Abstract This Study aims to investigate the determinants of brand loyalty (Customer satisfaction, Price sensitivity and word of mouth) affecting tourists' choice of five stars hotels on Jordan. The population of the study consisted of people who frequent select these hotels to stay. The researcher study data were collected using the non-random sampling method, where (400) questionnaires were distributed to

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_120

people who visited five-star hotels in Amman, Aqaba and the Dead Sea. To achieve the objective of the study, and to test hypotheses, the researcher used statistical program of social Sciences (SPSS) and (AMOS). The study results revealed that there is a statistical significant impact of brand loyalty determinants on tourists' choice in five stars hotel in Jordan, based on the study results the researchers recommends managers and decision makers should provide a superior service quality also training the staff and every person who would contact the tourists, finally they should undertake promotional and informational marketing activities. Thus, the guest has wonderful experience which will ultimately lead customer to be loyalty to the brand and repeat their visits to the same hotel.

Keywords Brand loyalty (BL) · Customer satisfaction (SC) · Price sensitivity (PS) · Word of mouth (WOM) · Tourists choice · Five stars hotels · Amman · Aqaba and Dead Sea—Jordan

1 Introduction

The hotel industry is growing very fast in the whole world. Competition is increasing among the hotel operators. Therefore, managers are concerned about increasing the profitability of hotels. Earlier, hotel operators were only interested in attracting new customers but now the trend is changing. Now, retaining an existing customer is more important than attracting new customers (Alshurideh et al., 2020; Alzoubi et al., 2022). Therefore, managers are concerned with making existing customers loyal to the hotel and they want to create repurchase intent in the customers.

The loyalty and the impacts on the customer choice have attracted interest in many empirical as well as exploratory investigations (Alshurideh, 2019, 2022). Researchers have created several constructs to refer to as well as look into the part of impact as well as loyalty incidents working with an assortment of conceptual frameworks (Alshurideh et al., 2012, 2017a, 2017b). Marketing research as well as marketing methods has compensated growing focus on procedures related to creating a good connection between consumer and brand (Aljumah et al., 2021; Hamadneh et al., 2021; Sweiss et al., 2021). It's frequently believed the brand would be the best asset of every business (Abu Zayyad et al., 2021; Tariq et al., 2022; Vukasovic, 2015). Therefore, this study is dedicated to investigate the impact of brand loyalty determinants on the tourists' choice of five stars hotels in Jordan.

2 Theoretical Framework and Hypotheses Development

2.1 The Brand Loyalty Concept

Brand is a name, sign, term, symbol, design or signaling combination that is intended to identify the products and services (Kotler & Armstrong, 2010). American Marketing Association (AMA, 2011) defined brand as "A brand is a "name, sign, term, symbol, or design, or a combination of them, intended to identify the products and services of one seller or group of sellers and to differentiate them from their competitor"." According to Tumewu et al. (2017) identified the brand as a factor for helping the customer by making data about the quality of the product; a customer who always purchases a product with specific brands knows well that these products will have, advantages, characteristics and qualities. Reviewing the literature, Kotler and Keller (2015), defined that a brand is "anything that identifies a seller's goods or services and distinguishes them from others". However, brand recognized as the apparent quality about the brand's segment, the express or the deceptive (Al-Hawary & Harahsheh, 2014; Alwan & Alshurideh, 2022).

Generally, the brand is a gathering of behaviors, the brand's customers and individuals from the association's channels which have the brand, empower the firm to has unendingly and competitive advantage, gets the brand's an incentive from its origins which comprises of the brand's notoriety, its apparent quality, picture, and its guess to the purchasers (Al-Hawary, 2013a, 2013b; Alshurideh et al., 2015).

American Marketing Association (AMA, 2011) defined brand loyalty as "the situation in which a consumer generally buys the same manufacturer-originated product or service repeatedly over time rather than buying from multiple suppliers within the category". Brand loyalty is also defined as the degree of consumer's attachment to a specific brand (Lee & Kang, 2012). However, Ali and Muqadas (2015) defined brand loyalty as a concept related to re-purchase intention and psychological commitment while Dehdashti et al. (2012) defined brand loyalty as a long-term relationship grounded on a customer's re-purchase intention and continuous commitment towards a brand. In this regard Wulandari (2016) adopted Oliver's (2010) definition of brand loyalty in which the concept identified as a variable with two sub-factors: a customer commitment to re-purchase and to re-patronize a good or a service. Moreover, Bozok et al. (2015) defined brand loyalty dependent on the behavior methodology accentuate the real addiction coming from the buy inclinations of customers, the definitions based on the attitudinal viewpoint center around the loyalty of consumer requests to the brand.

A review of the literature brand loyalty, as one of brand value basic dimensions, is defined as "the degree to which consumers buy a brand of product." In other words, it is the shoppers' inclination to continually pick a particular brand among restricting brands and dismissing the others. Most of studies that focused on brand loyalty, which is an important element of brand equation, take some concepts into consideration such as the brand customer value, the eagerness of consumers to purchase the brand, the price, and the attractiveness of the brand in the consumers eyes (Kautish, 2010).

Moreover, Rather (2018) reported that brand loyalty represents customer's positive attitude towards a brand or offering, in addition to repeat buying behaviour. Liu et al. (2012) find out that affective loyalty is positively related to attitudes toward co-branded products.

Previous research suggests that there are two dimensions of brand loyalty: attitude and behaviour (Chiu et al., 2013). Attitudinal loyalty is defined as the internal and psychological feeling of a consumer, such as liking, emotion, and obligation to a specific brand in the hope to engage continued buying without showing the actual purchase action (Yasmin & Raju, 2020). The attitude-based method is interested in discovering the influencing factors on purchase behavior, preference, commitment, word of mouth recommendation, and customer willingness to pay a higher price are how attitudinal loyalty is commonly measured (Shahzad et al., 2020).

Moreover, attitudinal loyalty is also seen as the extent of the client's psychological attachments, and the ability to help the business (Forgas et al., 2010). Accordingly, loyalty to attitudes requires strong word of mouth, the ability to refer to others and inspire them to use the products and services of an organization (Becker et al., 2016). Tomalieh (2015) pointed out that to increase sales and revenue, a company has to take behavioural loyalty into account since it is one of the core outcomes of the customer-company relationship. It is important to know this impact because attitudinal and behavioural loyalty has different impacts on brand performance or the firm performance (Farrukh et al., 2020).

2.2 The Tourists' Choice

It is a crucial of understanding why consumers will in general choose a specific destination and what kind of components impacts those (Wu & Lee, 2011). According to Kumar and Singh (2014) as contrast with the more youthful more established consumers are more loyal the brand where they use to stay while making a trip to a particular destination, as they are more conscious about the services of these hotel brands and it is very hard to change this discernment.

Moreover, Mueller and Szolnoki (2010), Almli et al. (2011) and Rahman reported that consumers are shaping quality desires based on quality signals during the buy choice cycle, henceforth extraneous attributes (for brand name, instance price, country of origin, etc.) are liable for buy choice, while natural attributes will influence preferring an item or service and influence brand loyalty. A generous assortment of consumer research affirms that extraneous item signals, for example, branding and packaging impact the buyers' item assessment on explicit item bunch like food, articles of clothing, etc.

Furthermore, Baruca and Čivre (2012) defined selection between alternatives important to consumers because they have to choose between two or more alternatives; otherwise, they are forced to buy a particular product or service. Consumers seek to obtain information about products and services and use them as part of logical problem solving in the decision-making process. Traditionally, these purchases

required brochures and contacts with a travel agent, however, today all the required information can be found on the Internet and consumers can compare the information relatively easily. Although before the final purchase decision, consumers evaluate various alternatives based on information received. The evaluation process becomes particularly difficult when the product is a hotel residence, because the hospitality service is intangible in nature. If a hotel is chosen, this information will depend on the characteristics of the product or service, quality, price, facilities, location, reputation, etc. When making a real buying decision, consumers weigh which of these traits gives them greater relevance and concern related to their personal values, needs and preferences. Stylos et al. (2016) destination choice includes choosing a particular place by assessing guests' emotions about another alternatives.

Kozak and Baloglu (2010) Consumer discernments may impact the choice of a location, the utilization of products and services while in holiday, and the choice to return. Since consistently, guests are offered a more noteworthy assortment of destinations, more choice of convenience, a more extensive scope of activities, and visits which are intended for explicit interests, it has now gotten genuinely hard for a person to choose where and how to go and where to remain, accordingly, the utilization of choice sets has gotten fundamental in buyer dynamic about the travel industry, friendliness, and recreation administrations.

Kim et al. (2012) explained the consideration of competitiveness of destination in various choice sets could also be significant in understanding the brand value of destination, including brand awareness, brand image, brand identity, brand loyalty.

2.3 Determinants of Brand Loyalty that Affect the Tourist's Choice

The researchers examined the factors affecting brand loyalty from different perspectives, shown in the following table.

Based on the above-reported determinants, three determinants were chosen for the purpose of the current study. These determinants are customer satisfaction, price sensitivity and word of mouth. The following paragraphs of the current section are dedicated to clarify these determinants.

Customer Satisfaction: According to Jana and Chandra (2016), customer satisfaction has become an important point in the hotel industry, unlike other industries; the hotel industry thrives due to customer retention. A hotel can only retain its customers through customer satisfaction. Customer loyalty depends mainly on the quality of services they receive at the hotel. Moreover, the hospitality industry has experienced the entry of many investors wanting to meet their customers' needs. Therefore, guests will look for better services if they were not satisfied with the services they receive from the hotel they lodge in (Jana & Chandra, 2016). Moreover, satisfaction has been defined as "satisfaction is a consumer's fulfilment response. It is a judgment that a product/service feature, or the product or service itself, provided

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a pleasurable level of consumption related loyalty, including level of under or over loyalty" (Oliver, 2010).

Moreover, Bianchi et al (2014), stated that higher satisfaction would result from trust on the brand. Therefore, customer satisfaction with said brand is a primary driver of loyalty. According to Han et al. (2011), customer satisfaction depends on the feeling about product compares with expectations of customers. If satisfaction is lower than expectation, the buyer is not satisfied; if expectation is appropriate, customer will be satisfaction. To measure customer satisfaction with the product/service, it is based on a comparison between the products/services feeling and service expectations.

Subagio and Dimyati stated the customer satisfaction is linked with customers' expectations concerning products or services perceived performance. Gaskari and Naeimavi examine customer satisfaction between the perceptual experiences of the overall performance of a product with all the expectations. Adhitama et al. (2017) stated that customer satisfaction of a product might be described through looking at the expectations of service with his knowledge of the services provided. If provided services exceed customer expectations, they're known as service that is outstanding. Based on above literature the hypotheses can be as:

H1: Customer Satisfaction has a significant impact on tourists' choice of five stars hotel in Jordan

Price Sensitivity: Kotler and Armstrong (2010) define price as "the amount of money that is collected for a product or service". Levy and Weitz (2012) defined price as the money that customers exchange in terms of service or product, or the value they receive (Kotler & Armstrong, 2010). It is important for the company to retain loyal customers who are willing to pay higher prices for their favourite brand and not buy on a low price basis (Alzoubi et al., 2020; Alshurideh et al., 2021). Brand loyalty customers are eager to pay more money and are less price sensitive.

According to Malc et al. (2016) examined the effects of a consumer's perception of price fairness on his buying decision and referred to it as an appropriate indicator of a consumer's buying decision. Also, Khuraim stated that price has a significant effect on brand loyalty which in turn affects the buying intent of the customers. Consequently, and according to the discussions. Moreover, Beristain and Zorrilla (2011) proof affirms that price is a significant determinants of customer loyalty to a specific brand and the customer loyalty to a brand is significantly affected by the way that shoppers see the purchase of these brands as value for the money, and the higher price sensitivity affectability of customer intensity of brand loyalty. Based on above literature the hypotheses can be as:

H2: Price Sensitivity has a significant impact on tourists' choice of five stars hotel in Jordan

Word of Mouth: Customer WOM is arguably the most important outcome of customer–firm relationships as a relational outcome in a business context. Customers consider verbal information reliable because the company cannot tamper with it, so it attracts the interest of potential clients, as a reliable source of information, due to its personalized transmission, content and context that reflects personal experiences. Scholars citing the importance of word of mouth acknowledge that it serves as peers'

advice, which can influence consumer choice, as well as product evaluations and purchase decisions (Zhang et al., 2010).

Whether intentional or not, if WOM receives positive, communication between customer can go beyond sharing direct experiences, to become storytelling and folklore, then narrative discourse about the company shapes the "truth" about the company in customers' minds. WOM communication appears reliable and impartial because the sender of the information usually does not earn it if the recipient decides to make a purchase (Cheung and Thadani, 2012). Furthermore, customer to customer interactions is increasingly important, which has considerable implications for firms; the exchange of information about customers' experiences influences each party's attitudes and behaviours (Blazevic et al., 2013). Through their extensive meta-analytic review of antecedents of WOM communication illustrate the important roles of satisfaction, loyalty, quality, commitment, trust and perceived value. WOM connections are also co-produced in consumer networks. However, customers who interact with a brand and/or service provider are expected to build positive attitudes more immediately than customers who do not engage with the brand or provider (Harrigan et al., 2016; Kurdi et al., 2020; So et al., 2014). Such attitudes are expected to be favorable which may lead to increased loyalty and/or favouritism intent (Al Kurdi et al., 2020; Hollebeek et al., 2016).

Kher et al., WOM provided by customers, online or offline, positive or negative, is closely reviewed by potential clients, making it a powerful marketing tool, such that trust in customer relationships and engagement with the company is a necessary strategic focus to companies. Loyal customer often act as trusted advocates through social media (e-WOM), informally linking networks of friends, relatives, and other potential clients with the organization (Khasawneh et al., 2021). Based on above literature the hypotheses can be as:

H3: Word of Mouth has a significant impact on tourists' choice of five stars hotel in Jordan

3 Study Model

Figure 1 shows the conceptual model of the study, in which three independent variables' (i.e., Brand Loyalty determinants: Customer Satisfaction, Price Sensitivity and Word of Mouth) were assumed to have significant impact on tourists choice. Studies that used to develop the model are shown in Table 1.

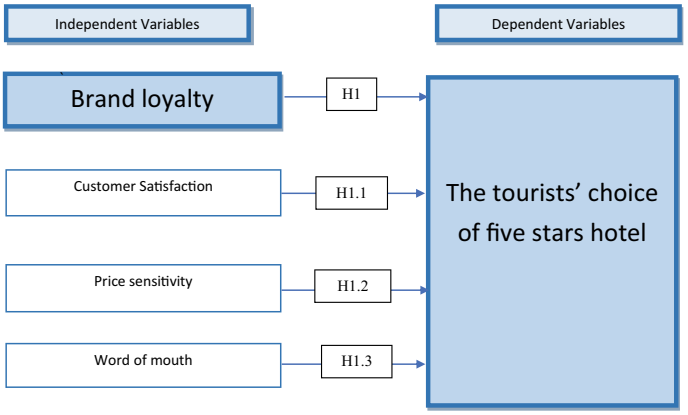

Fig. 1 Study conceptual model. *Source* This model has been prepared by the researcher based on these sources

Table 1 Examples of brand loyalty determinants on the choice

Factors	Authors
Service quality, perceived value, customer satisfaction, and brand image	Suhartanto (2011)
Service quality, perceived value, and customer satisfaction	Al-Hawary (2013a, 2013b)
Perceived quality, satisfaction and trust	Al-Hawary (2013a, 2013b)
Customer satisfaction, perceived quality, price, perceived value	Al-Hawary and Harahsheh (2014)
Brand name, brand price and brand quality	Devi (2014)
Price, perceived quality, perceived value, satisfaction	Al-Hawary and Harahsheh (2014)
Trust, price, customer satisfaction and perceived value	Fazal and Kanwal
Price and quality perception	Alić et al. (2019)
Brand equity, brand reputation, brand trust and word of mouth	Kumar et al. (2020)

4 Study Methodology

4.1 Study Population

The current study focuses on an important sector in the Jordanian economy, which is the luxury hotel industry in Amman, Aqaba, and the Dead Sea. The study population consists of people over 20 years old who frequent select these hotels to stay and eat, whether they are families, business owners or employees that require their job is to visit hotels to perform their duties. Since the large size of the study population and the inability to conduct a complete census, the study data were collected using the

non-random sampling method, where (400) questionnaires were distributed to people who visited five-star hotels in Amman, Aqaba and the Dead Sea. The questionnaires were distributed in both languages' Arabic and English due to some of the hotel's visitors are not realizing Arabic. Moreover, the questionnaires were distributed on two ways (150) paper questionnaires and (250) electronic questionnaires through Google forms. The retrieved questionnaires were (367) questionnaires, while it was found that (15) questionnaires were incomplete and not suitable for statistical analysis. Therefore, (352) questionnaires were used for statistical analysis, which represents a response rate (88%).

4.2 Study Instrument

The questionnaire was designed as a basic instrument to accomplish the study's purposes for identifying the impact of brand loyalty determinants on tourists' choice of five stars hotels in Jordan. This questionnaire consisted of three parts: the first part was composed of the introductory and questions related to demographic variables represented by (gender, age, educational level, and nationality). The second part was devoted to measuring the independent variable represented by brand loyalty determinants, which was developed by (Al-Hawary & Al-Khazaleh, 2020; Al-Hawary & Al-Menhaly, 2016; Al-Hawary & Al-Smeran, 2017; Al-Hawary & Alhajri, 2020; Al-Hawary & Hussien, 2017; Al-Hawary & Metabis, 2012; Al-Hawary & Obiadat, 2021; Al-Hawary et al., 2011, 2017; Alić et al., 2019; Alolayyan et al., 2018; Alshurideh et al., 2017a, 2017b; Cetin & Dincer, 2013; Metabis & Al-Hawary, 2013), where this variable divided into customer satisfaction measured through items (Q1–Q11), price sensitivity which was measured by items (Q12–Q16), and word of mouth which was measured by items (Q17–Q21). While the third part used to measure the dependent variable, which is the tourists' choice, where this variable's items were developed by (Unurlu & Uca, 2017), which was measured by items (Q22–Q25) used for this purpose.

4.3 Validity and Reliability

For identifying the validity and reliability of the study instrument, a set of methods were used that began to identify the face validity by presenting the questionnaire to a number of academic doctoral of various ranks and those with specialization in the field of study for determining the degree of phrases suitability to measure the study variables and linguistic validation in order to be able respondents easily understood it, where their names, academic ranks, and their work place listed in appendix (1). In addition, exploratory factor analysis (EFA) was used to test the convergent validity of the study instrument through the values of the average variance extracted (AVE), as well as the discriminant validity test by comparing the values of the average variance

extracted (AVE) with both maximum shared variance (MSV) and square root of average variance extracted ($\sqrt{}$AVE). The reliability of the study instrument was also confirmed by using Cronbach Alpha coefficient (α) to ensure internal consistency and McDonald's Omega coefficient (ω) to ensure the composite reliability. The results of these tests demonstrated in Table 2.

The results listed in Table 2 showed that the values of the items' loadings on the variables associated with them ranged between (0.704–0.814) which were higher than the minimum threshold for retaining the item represented by the value of 0.50 (Haig, 2018). The results also showed that the values of the average variance extracted (AVE) were higher than the minimum value for accepted of 0.50, where it was within the range (0.548–0.613) that is an indication of the convergent validity (Antunes et al., 2017). Moreover, the values of average variance extracted (AVE) of the latent

Table 2 Exploratory factor analysis results

Variables	Items	Loadings	AVE	MSV	$\sqrt{}$AVE	ω	α
Customer satisfaction	Q1	0.814	0.613	0.530	0.746	0.934	0.945
	Q2	0.734					
	Q3	0.782					
	Q4	0.775					
	Q5	0.786					
	Q6	0.779					
	Q7	0.776					
	Q8	0.784					
	Q9	0.787					
	Q10	0.791					
	Q11	0.789					
Price sensitivity	Q12	0.774	0.548	0.365	0.755	0.858	0.859
	Q13	0.729					
	Q14	0.704					
	Q15	0.759					
	Q16	0.733					
Word of mouth	Q17	0.767	0.574	0.327	0.776	0.876	0.871
	Q18	0.764					
	Q19	0.751					
	Q20	0721					
	Q21	0.785					
Tourists' choice	Q22	0.745	0.586	0.530	0.738	0.850	0.848
	Q23	0.786					
	Q24	0.738					
	Q25	0.791					

variables were greater than the maximum shared variance (MSV), as well as the values of square root average variance extracted ($\sqrt{}$AVE) were higher than the values of the correlation with the rest of the latent variables, where these are indicators of achieving discriminant validity (Crego & Widiger, 2016).

Regarding to reliability of the study instrument, the results presented in Table 2 indicate that the values of Cronbach Alpha coefficient (α) were within the range (0.848–0.945) which were higher than 0.70, which is the minimum value for realizing the internal consistency of the study instrument (Heale & Twycross, 2015). Further, the results stated that the values of McDonald's Omega coefficient (ω) that were ranged (0.850–0.934), thus it is greater than 0.80 the minimum limit for considering the instrument having a composite reliability (Zhang & Yuan, 2016).

Together with exploratory factor analysis (EFA), confirmatory factor analysis (CFA) was used to test the structural validity of the study model used through a bundle of indicators represented by the chi-square ratio (CMIN/DF), goodness of fit index (GFI), comparative fit index (CFI), Tucker-Lewis coefficient (TLI), and root mean square error of approximation (RMSEA). Figure 2 shows the results obtained by confirmatory factor analysis.

The results in Fig. 1 showed that the chi-square ratio (CMIN/DF) was (1.574) that was greater than 3 that expresses the high acceptable value for this indicator, and that the value of each of goodness of fit index (GFI), comparative fit index (CFI), and Tucker-Lewis coefficient (TLI) was higher than the acceptable minimum limit of 0.90. Moreover, the results illustrated that the value of root mean square error of approximation (RMSEA) reached (0.040) which is smaller than the acceptable upper threshold of 0.050, thus the study model has a structural validity (Gu et al., 2017).

5 Testing Hypotheses

Structural equation modelling is one of the statistical methods used to analyze the structural relationship between measured variables and latent structures, as well as to testing studies hypotheses. This statistical method was used for testing the current study hypotheses, where the Fig. 3 illustrates the structural model used to test the impact of brand loyalty determinants on tourists' choice of five stars hotels in Jordan.

Moreover, Table 3 shows the results of the main study hypothesis test that was "There is no statistically significant impact of brand loyalty on tourists' choice of five stars hotel in Jordan".

The results in Table 3 indicate that the value of the correlation coefficient (R) between brand loyalty determinants and the tourists' choice (0.653), and the value of the determination coefficient (R^2) that was (0.427), this value indicates that (42.7%) of the variance in the tourists' choice was due to the change in brand loyalty determinants of five stars hotel in Jordan. Also, the probability value (*P*) was less than 0.05, thus the null hypothesis was rejected and the alternative hypothesis that referred to "There is a statistically significant impact of brand loyalty determinants on tourists'

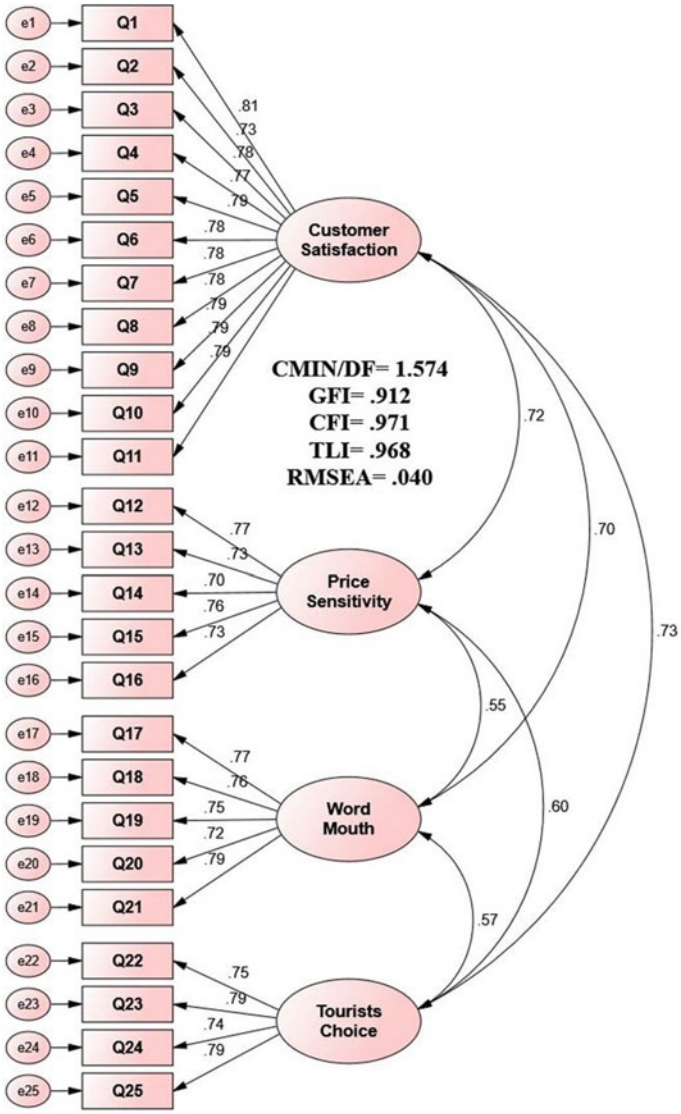

Fig. 2 Result of confirmatory factor analysis for the measurement model

choice of five stars hotel in Jordan" was accepted, and the standard impact value (β) was (0.653).

In addition to testing the main hypothesis, the sub-hypotheses of the study were tested that were referring to "There is no statistically significant impact of brand loyalty determinants dimensions on tourists' choice of five stars hotel in Jordan" (Fig. 4). Figure 3 shows the structural model used for that.

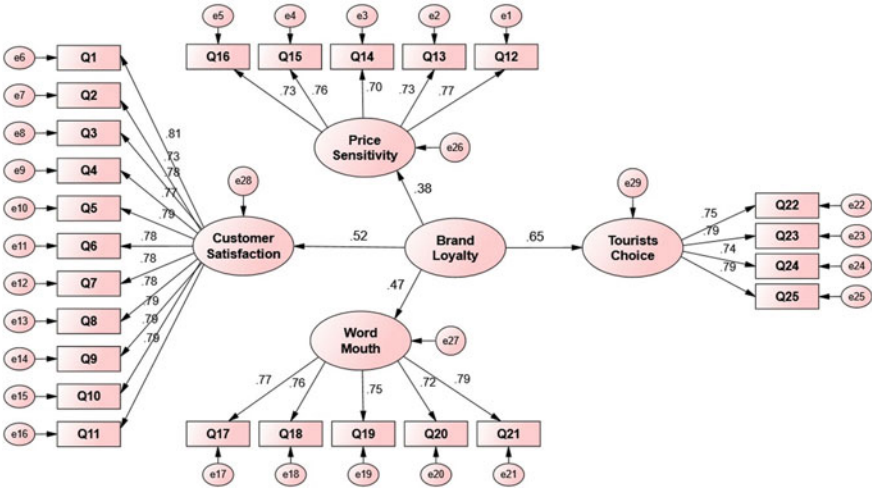

Fig. 3 SEM for testing the impact of brand loyalty determinants on tourists' choice

Table 4 shows the results obtained using the structural equation modelling (SEM) method to test the impact of customer satisfaction, price sensitivity, and word of mouth on the tourists' choice of five-star hotels in Jordan.

The results in Table 4 indicate that the value of the correlation coefficient (R) between brand loyalty determinants dimensions and the tourists' choice (0.672), and the value of the determination coefficient (R^2) that was (0.452), this value indicates that (45.2%) of the variance in the tourists' choice was due to the change in the dimensions of brand loyalty determinants of five stars hotel in Jordan. Moreover, the probability values (*P*) of all dimensions of brand loyalty determinants were less than 0.05, thus the null sub-hypotheses were rejected and the alternative hypotheses that referred to "There is a statistically significant impact of brand loyalty determinants dimensions on tourists' choice of five stars hotel in Jordan" was accepted, where the first rank was for the dimension of customer satisfaction with standard impact value (β) which was (0.486), followed by the dimension of price sensitivity with standard impact value (β) that was (0.147), while the last rank for the dimension of word of mouth with standard impact value (β) which was (0.118).

6 Discussion and Conclusion

The aim of this study was to investigate the impact of brand loyalty determinants on the tourists' choice of five stars hotel in Jordan. The independent variable (brand loyalty) was measured by using three determinants variables, i.e., customer satisfaction, price sensitivity and word of mouth. It was hypothesized that there is a significant positive impact of brand loyalty on the tourists' choice. More specifically, the three

Table 3 Result of testing the impact of brand loyalty determinants on tourists' choice

Path			R	R^2	Unstandardized coefficients		Standardized coefficients	C.R.	*P*
					Estimate	S.E.	β		
Brand loyalty determinants	→	Tourists' choice	0.653	0.427	0.812	0.050	0.653	16.137	***

Note * Refers to significance level $P < 0.05$, ** Refers to significance level $P < 0.01$, *** Refers to significance level $P < 0.001$

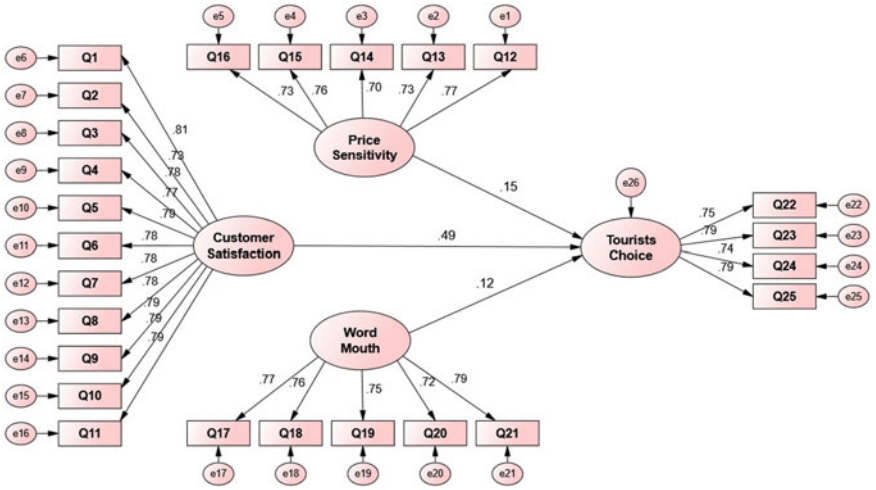

Fig. 4 SEM used to test the impact of brand loyalty determinants dimensions on tourists' choice

determinants of the brand loyalty were assumed to have significant positive impacts on the tourists' choice. On the basis of the results reached by the current study, it was concluded that brand loyalty as measured by the determinants of brand loyalty: customer satisfaction, price sensitivity and word of mouth has a significant impact on tourists' choice. Price sensitivity is highest determinant in the tourist choice process. When it comes to the quality of the service the hotel provide which should satisfy the guest of the hotel and meet the guest expectations that will drive the guest to spread word of mouth positively in front of others.

However, numerous studies have been accepted the hypothesis that there is a significant and positive impact of brand loyalty on tourists' choice. Bozok et al. (2015) examined the dimension of brand equity in choosing a hotel and found an impact of brand loyalty on customer choice. Alhedhaif et al. indicate that Saudi consumers of cosmetics product have significant brand loyalty towards their choice. Malik et al. (2012) analysed that brand loyalty have positive association with Intention to buy.

The results of the study showed that the customer satisfaction has a significant and positive impact on tourists' choice. The participants assessed customer satisfaction at a medium level. This means the services that the hotel provides moderately meets customer expectation. This moderate degree of customer satisfaction revealed in the current study can be explained by looking at the measure customer satisfaction with the service, it is based on a comparison between the services feeling and service expectations. In other words, the quality that the customer gets from the service. Suhartanto (2011) indicates that, satisfied guests will not automatically become behaviourally loyal (i.e., resettle in the future) unless they realize the hotel performs better on key features than other hotels. Tourist satisfaction positively affects the intention to return to place, local authorities may implement policies

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Table 4 Result of testing the impact of brand loyalty determinants dimensions on tourists' choice

Path			R	R^2	Unstandardized coefficients		Standardized coefficients	C.R.	*P*
					Estimate	S.E.	β		
Customer Satisfaction	→	Tourists' Choice	0.672	0.452	0.507	0.062	0.486	8.207	***
Price Sensitivity	→	Tourists' Choice			0.159	0.057	0.147	2.815	**
Word of Mouth	→	Tourists' Choice			0.123	0.053	0.118	2.301	**

Note * Refers to significance level $P < 0.05$, ** Refers to significance level $P < 0.01$, *** Refers to significance level $P < 0.001$

to control the perceived quality of the tourism experience, improve services and security, and compare destinations in terms of performance.

In a study conducted by Souri to determine the factors that involved in the customer satisfaction that leads to competitive advantages and finally customer loyalty and repeat purchase. According to Liata et al. Customers who are satisfied with the services provided by the hotel are very likely to be satisfied with the services experienced, which in turn will create loyalty among them.

On the basis of the data used in the current study, it was acknowledged that there was a significant positive impact of price sensitivity on tourists' choice. Price sensitivity studied in this study was evaluated by respondents was fairly evaluated. This may be due to the fact that in a consumer's mind, a high price is often associated with high quality. Price and quality is a reason to prefer a certain provider.

Concerning the significant impact of price sensitivity on tourists' choice, numerous previous studies confirmed this result. In a study conducted by Madupu and Cooley brand loyalty related to a consumer's brand attitude, as it reflects a consumer's commitment to the brand and their likelihood to repeatedly purchase and pay high prices to stay with the brand. In the same context, consumers' loyalty like intention to revisit and willingness to pay high prices are developed through their long-term interactions with the brand.

The results of the study showed that word of mouth has a significant positive impact on tourists' choice. Word of mouth as a determinant of brand loyalty was moderately rated by respondents. Brand loyalty described by the consumer behaviour of spreading positive word-of-mouth. A consumer's intention to advocate for the brand and spread positive word-of-mouth was found to sustain the consumer's brand loyalty and potentially to help the brand expand its market share Madupu and Cooley. Word of mouth it serves as peers' advice, which can influence consumer decision-making, as well as product evaluations and purchase decisions Zhang et al. (2010). Moreover, word of mouth is a type of direct reference for consumers, and its effect on brand attributes, on consumers' perceptions and attitudes when consumers select tourism destinations.

7 Recommendations

In light of its findings, on the basis of the results reached by the current study, it was concluded that brand loyalty as measured by satisfaction, price and word of mouth has a significant impact on tourists' choice; the researcher recommends five-star hotel managers to Provide a superior service quality with emphasizing on the staff ability to increase guest confidence, serve at the right time, and understanding the individual needs of the hotel guests. Undertake promotional and informational marketing activities via advertising tools and integrated marketing communication efforts. And Train the staff and every person who would contact the tourists, so the guest has wonderful experience in culture tourism which may turn into positive word of mouth.

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The Impact of Branded Mobile Applications on Customer Loyalty

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Abstract This Study aims to investigate the impact of using branded mobile applications on customer loyalty. The population of the study consisted of all users of Pharmacy One's mobile application in Jordan. The researcher used the purposive

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_121

sampling by taking 2035 active users of the on-line applications from 70,251 downloader; 500 questionnaires were distributed randomly. To achieve the objective of the study, and to test hypotheses, the researcher used statistical program of social studies (SPSS) & (AMOS). The study results revealed that there is a statistically effect of using branded mobile applications on customer loyalty, based on the study results the researcher recommends managers and decision makers to improving the system of customer services in order to improve their loyalty, by reviewing the system after receiving feedback from customers through mobile applications. Also enhancing the quality of system information by ensuring that the content is relevant to customer requirements. and improving the perceived quality of the customer by identifying the expectations of the customers and seeking to achieve these expectations, so that the gap between what they expect and what they actually get.

Keywords Branded mobile applications (BMA) · Customer loyalty (CL) · Healthcare technologies · Amman-Jordan

1 Introduction

After the booming of smart phones and tablets that helping people not only to contacting each other but doing their jobs and tasks through it, the on-line smart phones' applications take place as a service for the community starting from using applications for work and ending with gaming and socialization applications at home, in another word it's became a life style. This wide spread of the mobile devices is due to the extensive usage of the mobile phone's applications (Al Dmour et al., 2014; Alshurideh et al., 2019a, 2019b). Mobile applications are currently used by companies to help and serve their customer and clients without being on the spot. This action will save time and decrease the level of human contact within the services given (Akour et al., 2021; Alshurideh et al., 2021).

Medical sector and pharmacies are investing with the mobile applications to have a direct contact with patients and increase their compliance to medications. Also, is used as an informative reference for clients about health tips and drug-drug interactions and other related services. Chain of Pharmacies today are launching their own branded mobile applications to have a loyal customer and increase their sales through it.

Consumers' behavior has been observed during their usage of different mobile devices, results showed that consumers had positive emotion toward the responses they receive when visiting the mobile site which is considered as basic application of the pharmacies systems (Alshurideh et al., 2012a, 2012b; Al-Hamad et al., 2021).

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In pharmaceutical sector, there are many applications of mobile devices, there usage has led to useful changes in pharmacy practices, this refers to the fact that many of the pharmacy daily activities can be achieved by using the mobile devices, according to the vision statement issued by the American Association of the pharmacists of the Health system regarding the proposed role of information technology in practicing pharmacy. There are many features through which technology can participate in improving the pharmacy general performance (Aburayya et al., 2020a, 2020b; Taryam et al., 2020; Ghazal et al., 2021; Svoboda et al., 2021).

But there are advantages and disadvantages of using the mobile devices, applications with positive and tangible impact on the pharmaceutical products should be studied, this increasing trend towards using the mobile devices as instruments to manage the health information in a better way requires more education of the consumers (users), and in some cases might need placing some laws. The used mobile devices applications have been developed remarkably in the medical clinical practice with a number of applications for the clinical practitioners. Determining and selecting the reliable application from thousands of medical applications available on the internet or the applications stores a basic factor in assuring the effectiveness of these devices.

In summary, this research concerned itself with the impact of using branded mobile applications on customer loyalty in chain of pharmacies (a case study on Pharmacy One) in Jordan, Understanding customers responses to each of branded mobile applications sub variable (Service information quality, Service system quality, Awareness about mobile application and Perceived quality about mobile phone application) in order to help firm to measure the impact of this application and whether its' helpful and useful for their clients, and how important it is to invest in this online technology to formulate a new marketing plan and strategy to get the customer loyalty.

2 Theoretical Frame and Hypotheses Development

2.1 The Brand

The trade mark known to the customers makes them feel secure toward the use of the product, in a severe competing business environment, which contributes to high share to the brand, and placing high value to the product in the customer's mind (Hamadneh et al., 2021; Sweiss et al., 2021). The consumer distrust the brand if it quality changes, since the perceived quality is not the real product quality, it is the customer personal evaluation which shows the product's real quality, since quality represents the images established in the customer's mind, since he does not have enough information to evaluate the quality, the price is placed as a positive indicator with the perceived quality. Brand offers multiple benefits to the organization; these benefits include increased the likely hood to select the brand which leads to customers loyalty (Alwan & Alshurideh, 2022; Tariq et al., 2022). Also, brand expands to

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products from other categories, increases the product/ service market value because customers are ready to pay high prices (Abu Zayyad et al., 2021; Aljumah et al., 2021).

2.2 Branded Mobile Applications

In 2008, Apple opened its iOS App Store that was the primary application distribution service. This set the quality for applications distribution services for alternative mobile firms. This led to shopper's exploitation their mobile devices as the way of connecting to the online. Consequently, mobile phones began to be referred to as smartphone because of their various capabilities. Mobile and software package developers accomplished that they might take mobile web site capabilities up with new applications named mobile applications. The applications would have identical functions and capabilities as websites designed for a desktop or laptop computer. The websites were scaled down so they'd work mobile devices. This led to anover plus of mobile applications being developed and enforced. In 2010, the word "app" was listed because the "word of the year" by the yank idiom Society (2011). Early applications for mobile apps were for email, calendars, contacts, the securities market, and weather data. High demand from users led to mobile applications being employed in mobile games, factory automation, banking, order-tracking, and price ticket purchases.

The mobile business has continuing to grow quickly, with a complete of 3.6 billion unique mobile subscribers at the top of 2014 associated an addition of one billion subscribers predicted by 2020 globally. Branded Mobile Applications may be defined as the software that is downloadable and available on online stores for mobile phones and tablets, carrying the name or the brand of an existing firm to deliver products and services through it**.** In the theoretical frame, the study has addressed and demonstrated both the independent and dependent variable, the independent variable (branded mobile application) with its dimension (service information quality, service system quality, perceived quality of the trade mark and awareness about the mobile phone trade mark). The study has benefited from some these previous studies mainly that have addressed these dimensions, like (Monica et al., 2017); (Francisquinho, 2013).

Service System Quality: The researcher defines quality of the system as a general performance statement of the system, which can be measured by the customer's point of view and the degree of ease of use in marketing and satisfaction with the system. Quality of service, customer satisfaction and customer loyalty are three key elements for business organizations to strive to focus on (Al-Dmour et al., 2021; Alshurideh, 2022). An organization that does not focus on quality is not successful in its business, so, quality is an important tool for strong competitive advantage market. (Tehrani & Jamshidi, 2015; Alzoubi et al., 2020).

Service Information Quality: If the provided information by the mobile phone applications are inaccurate, insufficient and without visibility, or uncompleted, this will contribute to reduction in customers satisfaction. The researcher sees that the

availability of high quality information brings and attract more customers because of their loyalty to the quality of the information provided by the different applications for the pharmaceutical sector. Service Information Quality may be defined as the quality level of processes and procedures provided through the service whether it is available at the time needed for and work smoothly or not.

Awareness about the Mobile Phone Application: Awareness about the brand is identified as "the prospected buyer's ability to remember the brand in a product type". (Chen & Ching, 2007).Also identified as "the customer's ability to know the brand in the different conditions" while Ross identified it as "strength of the brand's presence in the customers mind".

The researcher sees that the consumer's ability to remember and distinguish some components of the brand within different conditions and provisions is considered basic and important condition to create the awareness about the brand. Awareness about the Mobile Phone Application may be defined as the level of consumer concessions about the brand of the mobile phone application and to which extent they can recall or recognize it.

The Perceived Quality about the Mobile Phone Application: Perceived quality is identified as "the consumer perception of the total quality or superiority of the product or the service". Swinker & Hines classify the perceived quality to four categories; essential, external, appearance and performance. Perceived quality and brand's image are determinants of loyalty to the brand. Many studies have indicated at the positive influence of the perceived quality on buying intention. The Perceived Quality about the Mobile Phone Application may be defined as the customer's judgment and perception about the total quality of the mobile phone application and its superiority to another.

2.3 Brand Loyalty

Loyalty to the brand is considered one of the important factors in the success of the commercial businesses since studying the client's loyalty through his behavior and the attitudes are basic methods in building the client's loyalty. Attitudes about loyalty were identified as the degree of the behavioral commitment regarding the unique correlations regarding their kind with the brand's value (Suhartanto & Noor, 2013: 65). Several researches believe that loyalty in the attitudes affecting the clients purchase repetition of the brand. Brand Loyalty may be defined as Deep commitment of customer to a product or service despite situational influences and marketing efforts having the potential to cause switching to another product or service.

Attitudinal Brand Loyalty: Attitudinal method issued in order to measure the clients' loyalty to the brand and increasing the number of the new clients. The clients' perspective method about the client's loyalty and the intention to re-buy the product or recommending it (Kandampully & Hu, 2007). So, the researcher sees that many studies use this kind of instruments to perform the customer's loyalty to the brand but measuring the loyalty to the brand with one instrument is an effective measure to

loyalty compared to customer satisfaction on level of retaining them. Also, attitudinal method issued in order to measure the clients' loyalty to the brand and increasing the number of the new clients. The clients' perspective method about the client's loyalty and the intention to re-buy the product or recommending it (Kandampully & Hu, 2007). So, the researcher sees that many studies use this kind of instruments to perform the customers loyalty to the brand but measuring the loyalty to the brand with one instrument is an effective measure to loyalty compared to customer satisfaction on level of retaining them.

Behavioral Brand Loyalty: From an analytical study conducted by (Glasman & Albarracin, 2006), the study indicated that the attitude greatly predicts the future behavior and understanding loyalty by the client is basic factor for the businesses because it helps marketing directors in designing programs to modify the clients' behavior in the future, especially changing the behavior from one specific brand to another. To find the motive for buying behavior, directors need understanding the clients' cognitive mechanisms which are considered important part of these attitude (Back, 2005).

Rewards programs issued by the companies to promote the client's loyalty to its brands increase the client's loyalty to that brand, because the client might depend on his loyalty to the brand on specific and desired behaviors and provide him with comfort. It the customer attitude to the brand is positive, the percentage of his loyalty to the brand will be higher because his attitude will contribute to be as an advertisement and promotion to the brand, also, those attitudes in loyalty will contribute to creating long-term loyalty relationship between the brand and the client (Meyer-Waarden, 2015). The researcher sees that, in order to achieve specific behavior from the client, there should be process to control the clients' behaviors in the relationship between the brand and the client, by including the client's psychological factor and his attitude. So, the researcher sees that, one group of behavioral intentions can be design as positive behavioral intentions. one of this is loyalty, and certain behaviors signal that customer are forging bond with a company, and when customer praise the firm, express preference for the company over other, recommend the company of service to other.

2.4 Branded Mobile Applications and Loyalty

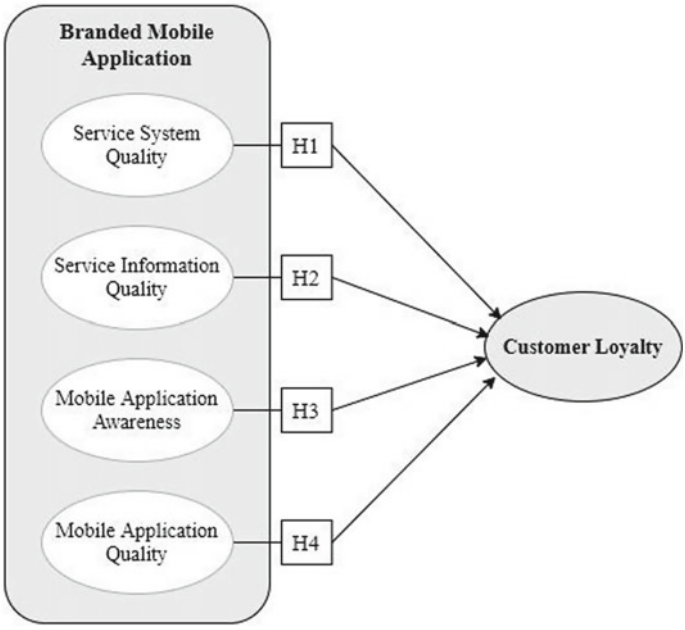
Bellman et al. (2011) have investigated the effect of branded mobile applications, including information and experimental applications related to attitudes toward the brand, and buying intention, results from their study showed that brand applications had positive impact of the attitude towards the brand, but less impact on the buying intention, also, found that the branded applications are new form of interaction information means, such as the websites, but differ from the advertisements thorough the internet because of the applications that characterizes by high level of the customers participation. Yu has investigated the influences of the mobile advertisement messages in building positive attitudes toward the band and the customer's

buying intentions. Results of his study showed that the mobile phone advertisements with interactive features have led to positive attitudes toward the brand and the buying intentions. Hoogendoorn study has proved the extent of the impact of the mobile applications with brand on the brand's cognitive and emotional shares and found that the interaction with branded applications has resulted in an increase in the positive aspects of the brand. Also, the results of that study showed that the interaction in the mobile applications with brand improved the brand's cognitive share.

Xie et al. study found that design of the mobile devices such as the screen's size, advertisement size and ease of uses influence the customers' emotional response to the mobile advertisements that might generate the positive emotions and increasing the customers buying intention. Kumar and Mukherjee have explained the attitudes of the mobile phone users in the shopping and purchase intention through the devices and found that the mobile phone does not always push the users to buy. Based on the above literature the study hypotheses can be formulated as:

H01: There is a significant impact of branded mobile applications) on customer loyalty of Pharmacy One

3 Research Model



4 Methodology

4.1 Population and Sample Selection

The sample of the study is defined as part of the sample that contains appropriate information about the study population. The study population was 70,251 downloaders of the mobile application. In order to obtain the appropriate information owned by some members of the population, the best technique to select the sample is the purposive sampling. According to Sekaran and Bougie (2016), a purposive sample is the one that contains individuals who are able to provide the desired information. Since the current study seeks to collect data from online users of the application, a purposive sample consisted of 2035 real active users of the mobile application, 500 users were randomly selected. Out of them, 423 users were accepted since they download and activate the intended application and answers the questionnaire form link.

4.2 Measurement Instrument

A self-reported questionnaire that consists of two main sections along with a section regarding control variables was used as the measurement instrument. Control variables considered as categorical measures were composed of gender, age group, educational level, and experience. The two main sections were dealt with a five-point Likert scale (from 1 = strongly disagree to 5 = strongly agree). The first section contained (19) items to measure branded mobile applications based on (Abbad & Al-Hawary, 2011; Abu Qaaud et al., 2011; Al-Hawary, 2012; Al-Hawary & Al-Fassed, 2021; Al-Hawary & Al-Menhaly, 2016; Al-Hawary & Al-Smeran, 2017; Al-Hawary & Hussien, 2017; Al-Hawary & Metabis, 2012; Al-Hawary et al., 2011, 2012; Alolayyan et al., 2018; Metabis & Al-Hawary, 2013). These questions were distributed into dimensions as follows: five items dedicated for measuring service system quality, five items dedicated for measuring service information quality, four items dedicated for measuring Mobile Application Awareness, and five items dedicated for measuring Mobile Application Quality. Whereas the second section included nine items developed to measure customer loyalty according to what was pointed by (Monica et al., 2017; Francisquinho, 2013).

5 Findings

5.1 Measurement Model Evaluation

This study was conducted structural equation modeling (SEM) to test hypotheses, which represents a contemporary statistical technique for testing and estimating the relationship between factors and variables (Wang & Rhemtulla, 2021). Accordingly, the reliability and validity of the constructs were tested using confirmatory factor analysis (CFA) through the statistical program AMOSv24. Table 1 summarizes the results of convergent and discriminant validity, as well the indicators of reliability.

Table 1 shows that the standard loading values for the individual items were within the domain (0.624–0.872), these values greater than the minimum retention of the elements based on their standard loads (Al-Lozi et al., 2018; Sung et al., 2019). Average variance extracted (AVE) is a summary indicator of the convergent validity of constructs that must be above 0.50 (Howard, 2018). The results indicate that the AVE values were greater than 0.50 for all constructs, thus the used measurement model has an appropriate convergent validity. Rimkeviciene et al. (2017) suggested the comparison approach as a way to deal with discriminant validity assessment in covariance-based SEM. This approachis based on comparing the values of maximum shared variance (MSV) with the values of AVE, as well as comparing the values of

Table 1 Results of validity and reliability tests

Constructs	1	2	3	4	5
Service system quality	**0.755**				
Service information quality	0.564	**0.760**			
Mobile application Awareness	0.612	0.538	**0.762**		
Mobile application quality	0.488	0.542	0.493	**0.722**	
Customer loyalty	0.692	0.689	0.665	0.677	**0.748**
VIF	5	5	4	5	9
Loadings range	0.622–0.822	0.638–0.854	0.624–0.866	0.682–0.766	0.631–0.872
AVE	0.570	0.577	0.580	0.521	0.559
MSV	0.511	0.502	0.488	0.469	0.509
Internal consistency	0.866	0.868	0.841	0.840	0.915
Composite reliability	0.868	0.871	0.845	0.844	0.918

Note VIF: variance inflation factor, AVE: average variance extracted, MSV: maximum shared variance, Bold numbers refer to $\sqrt{\text{AVE}}$

square root of AVE ($\sqrt{}$AVE) with the correlation between the rest of the structures. The results show that the values of MSV were smaller than the values of AVE, and that the values of $\sqrt{}$AVE were higher than the correlation values among the rest of the constructs. Therefore, the measurement model used is characterized by discriminative validity.The internal consistency measured through Cronbach's Alpha coefficient (α) and compound reliability by McDonald's Omega coefficient (ω) was conducted as indicators to evaluate measurement model. The results listed in Table 1 demonstrated that both values of Cronbach's Alpha coefficient and McDonald's Omega coefficient were greater than 0.70, which is the lowest limit for judging on measurement reliability (De Leeuw et al., 2019).

5.2 *Structural Model*

The structural model illustrated no multicollinearity issue among predictor constructs because variance inflation factor (VIF) values are below the threshold of 5, as shown in Table 1 (Hair et al., 2017).This result is supported by the values of model fit indices shown in Fig. 1.

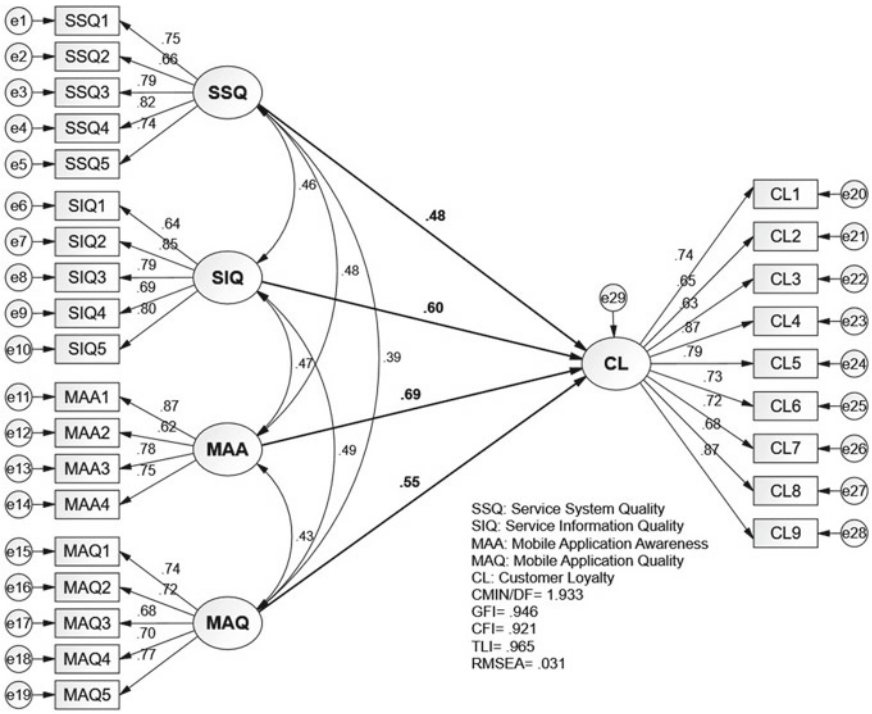


Fig. 1 SEM results of the branded mobile applicationseffect on customer loyalty

Table 2 Hypothesis testing

Hyp	Relation			Standard beta	*t* value	*p* value
H1	Service system quality	→	Customer Loyalty	0.483	20.04*	0.03
H2	Service information quality	→	Customer Loyalty	0.609	27.83**	0.002
H3	Mobile application awareness	→	Customer Loyalty	0.692	30.72***	0.000
H4	Mobile application quality	→	Customer Loyalty	0.550	25.37**	0.005

Note * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

The results in Fig. 1 indicated that the chi-square to degrees of freedom (CMIN/DF) was 1.933, which is less than 3 the upper limit of this indicator. The values of the goodness of fit index (GFI), the comparative fit index (CFI), and the Tucker-Lewis index (TLI) were upper than the minimum accepted threshold of 0.90. Moreover, the result of root mean square error of approximation (RMSEA) indicated to value 0.031, this value is a reasonable error of approximation because it is less than the higher limit of 0.08. Consequently, the structural model used in this study was recognized as a fit model for predicting the DEP and generalization of its result (Ahmad et al., 2016; Shi et al., 2019). To verify the results of testing the study hypotheses, structural equation modeling (SEM) was used, the results of which are listed in Table 2.

The results demonstrated in Table 2 show that mobile application awareness has the greatest positive impact on customer loyalty ($\beta = 0.692$, $t = 30.72$, $p = 0.000$), followed by service information quality ($\beta = 0.609$, $t = 27.83$, $p = 0.002$), then mobile application quality ($\beta = 0.550$, $t = 25.37$, $p = 0.005$), and finally the lowest impact was for service system quality ($\beta = 0.483$, $t = 20.04$, $p = 0.03$). Thus, all the minor hypotheses of the study were supported based on these results.

6 Discussion

The main hypothesis presumed that there is a significant and positive effect of the branded mobile applications on customer loyalty. This hypothesis was tested based on the data collected from the respondents. The branded mobile application was measured using the items (1–19) of the questionnaire, while customer loyalty was measured by the items (20–28) of the questionnaire. Since the independent variable, the branded mobile applications consisted of four dimensions in the current study, which were the dimensions used in the sub-hypotheses, the discussion of the main hypothesis was combined with the discussion of the sub-hypotheses.

However, numerous studies have been accepted the hypothesis that there is a significant and positive impact of branded mobile applications on customer; loyalty.

Lin and Wang examined the determinants of customer loyalty in mobile commerce contexts and found an impact of perceived value of mobile applications on customer loyalty. Aydin and Özer analyzed the antecedents of customer loyalty in mobile telecommunication in Turkey and revealed a significant effect of perceived service quality on customer loyalty. One of the most pivotal intangible advantages of mobile applications is the improved customer service.

7 Recommendations

In light of its findings, the researchers recommend managers and decision makers to improve the system of customer services in order to improve their loyalty, by reviewing the system after receiving feedback from customers, and enhancing the quality of system information by ensuring that the content is relevant to customer requirements, the timing of the information and its practical usefulness to customers. Also Raising customer awareness by focusing on advertising, promoting and benefiting from the applications provided and encouraging customers to download and use them. The service provider can use the rewards to achieve this goal. Finally Improving the perceived quality of the customer by identifying the expectations of the customers and seeking to achieve these expectations, so that the gap between what they expect and what they actually get.

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Impact of Internal Marketing Practices on Intention to Stay in Commercial Banks in Jordan

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Abstract The study aimed at identifying the impact of internal marketing practices on the intention to stay in commercial banks in Jordan. The internal marketing practices represented by (empowerment, training programs, incentives and rewards, internal communication and administrative support). The study population consists of employees of Commercial Banks in the northern region of Jordan; a sample was taken from the study population. The questionnaire was distributed to 550 of study samples, 521 were valid for statistical analysis. To achieve the objectives of the study and test hypotheses statistical analysis programs (IBM SPSS 24) and (SMARTPSLS, v. 3.2.6) were used. The study found that there is a statistically significant effect of internal marketing practices on Intention to stay in commercial banks in Jordan. Based on the study results, the researcher recommended the managers and decision makers in the commercial banks in Jordan to emphasize the importance of job

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_122

commitment, which generates the desire of employees to maintain their membership in the banks and their willingness to pursue organizational goals and accept their values and objectives.

Keywords Internal marketing practices · Intention to stay · Commercial banks · Jordan

1 Introduction

Internal marketing practices concept emerged to allow organizations to prove themselves and achieve success, and since organizations are the main pillar in the service sector depends mainly on human resources, therefore, employees and trying to retain them are considered the organization success cornerstone. Service providers are more interactive with the customer, with employees bearing the brunt of success. Accordingly, marketing directed towards employees within organizations is considered one of the essentials for the organizations work success (Al-Hawary & Obiadat, 2021; Al-Hawary & Alhajri, 2020; Al-Hawary, 2013; Al-Hawary & Batayneh, 2010; Al-Hawary et al., 2013a, b, 2017; Altarifi et al., 2015; Al-Hawary & Al-Menhaly, 2016; Al-Hawary & Al-Smeran, 2017; Al-Hawary & Harahsheh, 2014; Al-Hawary & Hussien, 2017; Alolayyan et al., 2018; Alshurideh et al., 2017). And since each organization sets a set of goals and strives to achieve them through the application of activities carried out by employees who have specific qualifications and capabilities, and make their efforts to achieve the goals of the bank and in return they get many benefits from it that satisfy their needs, so it can be said that the relationship between employees and the bank is an integrated relationship (Al-Hawary & Al-Syasneh, 2020; AlTaweel & Al-Hawary, 2021; Al-Hawary et al., 2020; Alhalalmeh et al., 2020; Al-Nady et al., 2016; Al-Hawary & Nusair, 2017; Al-Lozi, et al., 2018; Al-Hawary & Al-Namlan, 2018; Al-Hawary & Mohammed, 2017; Al-Lozi, et al., 2017; Al-Hawary et al., 2012; Al-Hawary & Alajmi, 2017). For the organization to achieve goals, it must retain competent employees and set up appropriate compensation programs in order to ensure their commitment and survival (Alshurideh et al., 2020; Kurdi et al., 2020). Successful organizations are those who can harness their human resources to develop their products and their customers desires, and work to provide all material and moral capabilities that help these resources to develop and be creative in carrying out the required tasks, and always strive to preserve these resources due to their cost and high value in helping the organization achieve its goals, through research briefing, its found that commercial banks strive to secure an encouraging and attractive work environment, which motivates employees to stay and continue working for these banks (Al Kurdi et al., 2020; Alshamsi et al., 2020; Alshurideh, 2022). Therefore, this study came to determine the extent of the impact of internal marketing practices on the intention to stay in commercial banks in Jordan.

2 Literature Review and Hypotheses Development

2.1 Internal Marketing

A new concept of marketing appeared in the early eighties of the last century, called internal marketing, where the interest in the human resource increased significantly, in order to reach the quality level required of customers (Al-Hawary & Abu-Laimon, 2013; Al-Hawary et al., 2013a, b; Metabis & Al-Hawary, 2013; Mohammad et al., 2020). Participation processes between different departments had a prominent role in building and strengthening the relationship between employees through successful internal marketing practices application, and the internal marketing concept confirms that collective work among employees in all departments is an important development factor, and a method to maintain the continued organization success (ELSamen & Alshurideh, 2012; Alkitbi et al., 2020). It also indicates that the relationship between the organization and its employees must be a positive relationship, which in turn can lead to the development of understanding among employees and enhance their sense of belonging, as well as providing products and services to employees and building a long-term relationship with them (Alameeri et al., 2020; Khasawneh, 2016).

Internal marketing stresses the importance of the marketing within the company by focusing on the employee and providing a source of competitive advantage (AlShehhi et al., 2020; Alshurideh et al., 2015). Through the internal marketing strategy, employees are treated as internal customers who must be convinced of the company's vision and value just as strongly as external customers (Alsuwaidi et al., 2020; Al-bawaia et al., 2022). Thus, satisfied employees are those who have a high commitment to roles within the organization in terms of achieving organizational goals, and the implementation of internal marketing may be some kind of difficulty if internal customers are not satisfied, and therefore there will be difficulty in providing good service to external customers from internal customers (Aburayya et al., 2020; Alzoubi et al., 2022). Those who are not satisfied, and this will affect the organizations productivity (Al-Khayyal et al., 2020, 2021; Solomon, 2017).

It is necessary to establish a long-term relationship with employees, and consider them internal customers, models have been developed based on the idea of making the worker's job attractive; because employee satisfaction will lead to customer satisfaction, and make employees more loyal to their organizations, and this works to attract better employees, and increases their motivation (Alshurideh, 2019; Al-Dhuhouri et al., 2020). Thus, the increased recognition of the employee's importance role in the service industry prompted organizations to adopt the internal marketing concept, and thus treat them as internal customers. Meeting the internal customer needs makes the business in a better position; to provide the quality required to satisfy external customers (Alshurideh et al., 2016; Svoboda et al., 2021). Establishing internal marketing involves developing and retaining successful employees and demonstrating a positive relationship between organizations and their employees (Aljumah et al., 2021; Hayajneh et al., 2021). Internal marketing is a complement to human resource management; good internal programs create employee satisfaction,

and this inevitably leads to external customer satisfaction (Shehada & Omar, 2015; Khasawneh et al., 2021a, b).

It should be noted the advantages that internal marketing gives organizations: encourage employees to perform better, empower the employee so that they are able to accept powers and assume responsibilities, achieve a greater understanding of the organization's goals, policies, procedures, and directions, and encourage the employee to provide distinguished service to customers, by commending their contribution to the organization successes, and achieving a better level of coordination and cooperation between the various organization departments and divisions (Abu Hamra, 2017; Lee et al., 2022a, b).

Many studies came to show the internal marketing dimensions, and these dimensions differed according to the different researchers viewpoints. Empowerment is a transfer of responsibility and authority, and an invitation to organization employees to participate in the information and knowledge provided by the organization through the database and decision-making, and therefore in the decision-making power becomes responsible for the quality of what he decides or what he performs, which leads to the transfer of powers from the president to employees (Alzoubi et al., 2022; Metabis & Al-Hawary, 2013; Tariq et al., 2022). Training programs are the systematic development of employees' knowledge, skills and attitudes required by employees; to perform sufficiently in a particular task or function. (Ramos, 2015; Alshraideh et al., 2017) and organizations resort to training their employee; In order to qualify him for the work that he will perform within the organization, or in order to raise his production capacity, or work to provide him with the necessary skills that appear due to environmental and technical changes that require new skills, Rewards and incentives are some driving force within the employees through which they try to achieve some goals in order to satisfy some needs, it is a feeling or desire to do or not to do something to satisfy a certain need (Abidin et al., 2017; Alshurideh et al., 2022). Internal communication is the work of internal communication that facilitates transactions between individuals and groups within the organization, and obtaining correct, reliable and timely information for the employee, in order to enhance knowledge, in addition to providing a healthy work environment that promotes motivation, creativity, effectiveness, and cooperation through the culture components, values and organizational assumptions, that develops a sense of belonging and loyalty among all employees (Alshura et al., 2016; Alyammahi et al., 2020; Sweiss et al., 2021).

2.2 Intention to Stay

Many researchers have noticed the lack of specific and clear definitions of intentions to stay at work in much of the literature that talks about the intention to stay at work or even leave it, and there are some researchers who have explained this; Since they considered intentions to remain in work a self-explanatory factor without the need to set definitions, Many researchers consider the intentions to stay at work or leave

it as the last step in the decision-making process towards staying at work within the organization.

Leaving work is one of the tendencies that lead to complete separation from belonging to a particular social system at the exclusive and personal initiative of the employee (Mohammad et al., 2020; AlHamad et al., 2022). Halawa (2015) adds that in contrast to the intention to stay at work, there is a feeling that some employees may have job instability; If the employee feels dissatisfaction, his future career is threatened in the organization in which he works, and the unknown makes him doubt whether he will stay within the organization or leave it, and this feeling will always provoke the employee to a continuous review his survival in his works, and trying to search for a better job to improve his conditions, and provide him with work stability and tranquility (Al-Dmour et al., 2021; Allozi et al., 2022; Shamout et al., 2022).

Sadiq (2018) adds that the intention to stay or leave work is affected by organizational commitment, as it plays a key role in the employee's continuation to work within the organization, as organizational commitment works to reduce the levels of some negative phenomena in organizations such as absence, leaving work, and evading performance of duties. The researcher believes that the role of internal marketing shines through at this stage; As the internal marketing and the dimensions that it contains, such as employees training, the system of rewards and incentives, administrative support, and internal communications between the manager and employees and among the employees themselves, play an important role in influencing the employees psychology, which inevitably leads them to organizational commitment, improving the their work quality and their performance, Thus, this improves the organization reputation in which they work, and increases the customer satisfaction outside the organization, and at this moment, the employee can only expect everything that is wonderful, so the employee has that wonderful feeling that accompanies him all the time that he does not want to leave this organization, which provided all the material and moral support his needs; thus puts all his energy into trying to stay in his job.

2.3 Relationship Between Internal Marketing and Intent to Stay

Internal marketing practices lead to employees' adherence and increased desire to stay in the workplace, and to achieve organizational commitment that generates a sense of belonging to the organization, which in turn is considered the motivation for innovation and maximum energies. Internal marketing is also considered as a strategic direction concerned with providing a suitable work environment for employee. The success in applying internal marketing practices is reflected positively on external marketing practices, as training and motivating employees and securing a suitable work environment for them makes them capable of their best to serve customers (Alshura et al., 2016; Hasan et al., 2022).

Also, internal marketing has a significant and clear impact on organizational processes, an important factor that led to employee commitment is behavior with employees as internal organizational clients, in order to enhance and improve employee commitment and engagement. Al-Majali et al. (2016) add, that internal marketing is a social process through the organization's application to manage the communication process, and the interactions that take place between the organization and its employees, friendship, the needs of respect between the manager and the employees, in addition to the needs of self-realization such as promotion to a higher position, all of which can only be achieved through the application of internal marketing; Internal marketing is an integrated administrative process among all functions in the organization, which mainly focuses on that all employees possess the experience and skill, to implement operations to satisfy the external customers needs and desires, and this is only done by preparing and motivating them to perform their work effectively and efficiently.

Al-Omari and Al-Yafi (2017) add that there are some things that affect the individual's feeling of wanting to stay in his work or leave; The work environment has a great impact on the employee's desire to stay in his work within the organization, and many organizations have sought to make basic changes in the work environment to make it more comfortable for employees; to keep the inner feeling that he is seriously willing to remain in his organization, The work environment includes several aspects, including what is material, psychological, and social. During the development of industrial psychology, the physical environment for work was given high importance that it has a significant and important impact on employee productivity. The work environment does not consist only of the physical components, but also includes the psychological and social aspect. Accordingly, the research hypothesis can be formulated as follows.

There is a statistically significant impact of internal marketing practices on the intention to stay in the commercial banks in Jordan.

3 Study Model

See Fig. 1.

4 Methodology

4.1 Study Population

The study population represented all employees of commercial banks in the northern region of Jordan in the governorates of (Irbid, Mafraq, Jerash and Ajloun). The researcher used a Convenience Sampling represented by workers in commercial

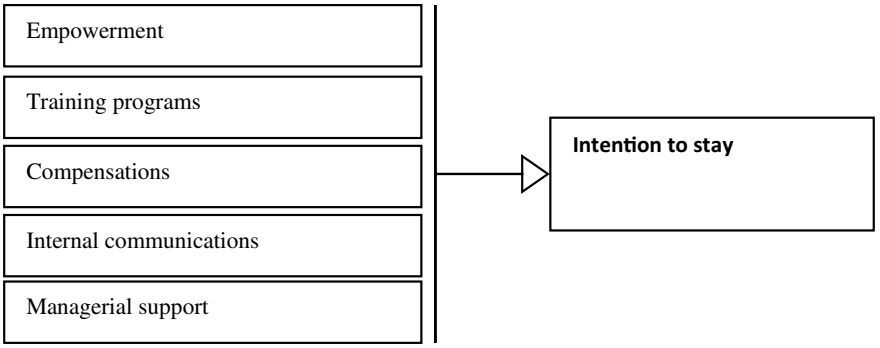

Fig. 1 Theoretical model

banks in the northern region who cooperated with the researcher in distributing the questionnaire. To achieve some criteria such as ease of access to the study sample of workers, and coverage of the northern region in Jordan. The study tool was distributed to the sample with 550 questionnaires, (521) questionnaires capable of statistical analysis were retrieved.

4.2 Study Tool

The study tool included four sections: the first section was for the purpose of collecting data on the demographic factors of the study sample represented by (gender, age, educational qualification, years of experience), while the second section related to the internal marketing practices with its dimensions (empowerment, training programs, and compensations, internal communication, and managerial support). In order to develop this section, the researcher used studies (Khasawneh, 2016; Toa & Martin, 2015; Wilmark, 2018). The third section is represented by the intention to stay based on studies (Hyun-Woom & Yuan, 2015).

4.3 Validity and Reliability

The researcher used the Cronbach's alpha coefficient test to verify the internal consistency of the study tool, in order to verify the reliability of the tool. Convergent Validity and Discriminant Validity were also used to verify the validity of the tool.

Factor loading: To ensure the reliability of the questionnaire statements by examining the path loadings values in order to ensure the existence of a relationship between indicators with latent variables or the absence of (latent variables) for each of them, the researcher also used factor analysis to assess the ability of the factors model to express data. The accepted value is the one with loading values (0.55) or

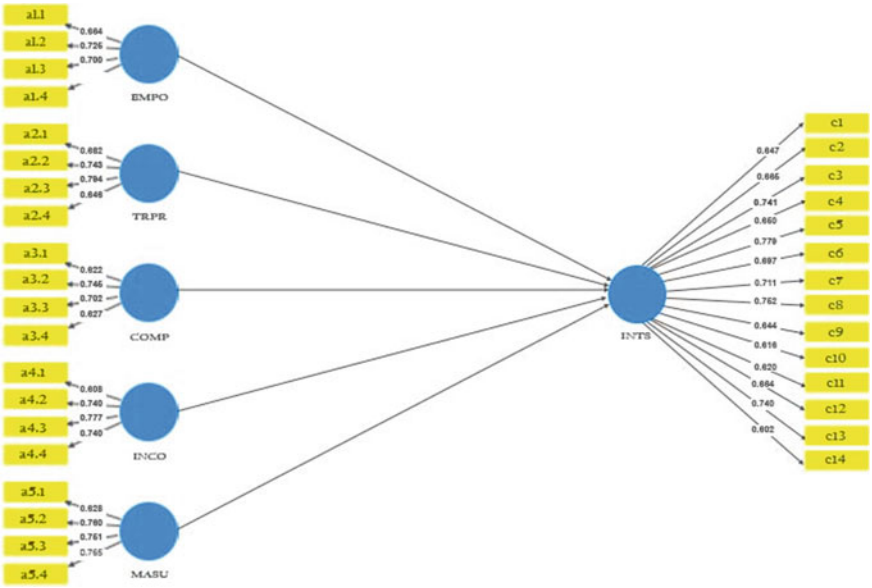

Fig. 2 Factor loading: the proposed model after deleting the statements

higher (de Leeuw et al., 2019). All of the questionnaire statements were accepted except for two statements for the variable (intent to stay) (C13, C14), which got less than (0.55), while the rest of the statements got values higher than (0.55 ≤ Path Loading-Factors Analysis Result-), which are accepted as greater values from (0.55), shown in Fig. 2.

Discriminant Validity: The discriminant validity test measures the degree of divergence of the variables of the study from each other, and based on that judgment is that there is no similarity between the variables and that each variable represents itself, by verifying that there is no level of linear correlation with a high degree (Multicollinearity) between the domains of the independent variable and the domains of the dependent using the criterion Fornell–Larcker Criterion) and using (Squared Average Variance Extracted) and as shown in Table 1.

The square root of the values of the test coefficient of confidence (AVE): Average Variance Extracted must be higher than the values of the correlation of the corresponding row and column variables up to half of the study tool with its differential validity (Hair et al., 2017), and this shows that the square roots of (AVE) values It is higher than the values of the correlation coefficient between the row dimensions and the corresponding columns, which reflects that the tool is characterized by its discriminant validity. Therefore, the results of the tests (convergent validity and discriminant validity) showed the validity and reliability of all measures of the study tool. The results, as they are in Table 1, indicate that the degree of correlation

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Table 1 The (Fornell–Larcker criterion for multicollinearity) between the dimensions of the independent variable

	Empowerment	Training programs	Compensations	Internal communications	Managerial support
Empowerment	0.880				
Training programs	0.650	0.870			
Compensations	0.660	0.550	0.854		
Internal communications	0.590	0.731	0.831	0.863	
Managerial support	0.570	0.717	0.849	0.666	1

is medium between the independent study variables, and the values of the correlation coefficients ranged between the independent variables (0.55–0.88) and the significance level ($\alpha \leq 0.05$) for all correlation coefficients.

Composite Reliability (CR): The analysis was used to ensure that all the variables of the proposed model are reliable. This test is considered to be better compared to Cronbach's alpha test because it takes all path loading values into account, unlike Cronbach's alpha test, which considers all path loading values to be equal. And constant for all indicators (Rimkeviciene et al., 2017), the values of the study variables showed acceptance (CR $\geq$ 0.70), because all values (CR) greater than (0.70), and this is an indication of the stability of the test results. The application of this tool results in the ability to generalize the results of the study in light of its practical limitations.

Average Variance Extracted (AVE): This test is used in order to verify that all study variables in the model are reliable, and (AVE) values are acceptable if the values are greater than (0.50) (Rimkeviciene et al., 2017), and all (AVE) values are greater than (0.50). This is an indication of the acceptance of the reliability of the variables of the proposed model. Table 2 shows the summary of the values of (AVE) which is greater than (0.5) and also the (CR) values of the model variables, which are greater than the values (0.70) and indicate the acceptance of the reliability of the model variables and reflects the convergent validity of the study tool.

Table 2 Results of (AVE), (CR) and (Cronbach's alpha) test

	(AVE)	CR	Cronbach's alpha
Empowerment	0.57	0.853	0.837
Training programs	0.600	0.90	0.881
Compensations	0.741	0.891	0.874
Internal communications	0.630	0.840	0.892
Managerial support	0.54	0.799	0.822
Empowerment	0.540	0.900	0.902

Table 3 Results of the variance inflation factor (VIF)

	VIF
Empowerment	2.331
Training programs	1.893
Compensations	3.422
Internal communications	2.589
Managerial support	2.173

Table 4 Quality indicators of conformity to the study data model (Model Fit)

Indicators	Acceptance indicator	Result
Standardized root mean square residual (SRMR)	Less than 0.08	Accepted
(NFI)	More than 0.90	Accepted
(RMS_theta)	Less than 0.12	Accepted

Autocorrelation test: The researcher used the Variance Inflation Factor (VIF) test to identify the degree of Autocorrelation between the independent variables. The results show as they are in Table 3 that the independent study variables do not suffer from the problem of Autocorrelation, as the values of the variance inflation factor (VIF) are less from (5).

5 Model Fit

Table 4 shows that all the values of indicators used in evaluating the validity of the model were acceptable, as the SRMR ratio reached (0.035) and appears to be less than (0.08), and the NFI value was (0.91) which is greater than the value The minimum permissible value is (0.90), and the value of the square root of the approach error (RMS_theta) is (0.06), which is also less than (0.12).

6 Testing Hypotheses

Table 5 shows that internal marketing practices affect, with statistical significance, the intention to stay in commercial banks in Jordan, with a value of F (30,881). It is a statistically significant value ($\alpha \leq 0.05$), and the R^2 value of (788.) indicates that internal marketing practices explain (78.8%) of the changes in survival intention, and the correlation coefficient reached $R =$ (62.2%), and this indicates the existence of a relationship Between internal marketing practices and the intention to stay, and the results of the partial analysis of this hypothesis showed that

Table 5 Hypothesis testing

Relation	Standard beta	*t* value	*p* value	Result
Empowerment → intention to stay	0.105	1.200	0.363	Not supported
Training programs → intention to stay	−0.224	−2.511	0.033	Supported
Compensations → intention to stay	0.490	5.587	0.000	Supported
Internal communications → intention to stay	0.268	2.793	0.004	Supported
Managerial support → intention to stay	0.210	2.151	0.059	Not supported

Note * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

internal marketing practices (internal communication, managerial support, training programs) contribute to the direct impact on the intention to stay, and this is shown through the (β) values of (0.105), (0.224), (490.), (268.) respectively at the level of ($0.05 \geq \alpha$), As for each of the practices (empowerment, incentives, and rewards), their effect was not statistically significant, as the significance level reached (0.363) (0.059), respectively, and explained above. The significance ($\alpha \leq 0.05$) of internal marketing practices (empowerment, training programs, managerial support, internal communication, incentives and rewards) in the intention to stay in commercial banks in Jordan.

7 Discussions

Study results showed that Jordanian commercial banks encourage communication, interaction and participation between departments as a major key to achieving and strengthening the relationship between employees through the application of internal marketing concepts, as internal marketing emphasizes teamwork among employees, which is an important factor in their development and maintaining successful business in them. study results also showed that the intention to stay works to reduce many negative phenomena such as the leaving work, absenteeism, and evasion from performing work, increases the level of belonging, leads to increased productivity, and reduces the cost resulting from employee absenteeism, as it creates a feeling that this bank provides, a better career path, better workers effort, plus workers usually believe that there is no discrimination in reward or distribution of other fringe benefits. The study results indicate that there is an impact of internal marketing practices on the intention to stay at work, that the process of empowering the employee and involving him in decision-making has an impact on the intention to stay at work by activating his role as a member of the decision-making process and this enhances the employee's desire to maintain his membership within the organization, When transferring responsibility and authority to the employee, transferring and inviting employees to share information and knowledge, the employee generates a kind of job stability. Because it helps with continuous communication between employees and to ensure that individuals are committed to staying for a longer period of time,

and that they have the desire to work, and internal communication works to identify employees who seek to achieve the work system goals. Administrative support also reflects the individual's sense of commitment to work, as he feels the need to continue working, and usually the bank seeks to make basic changes in the work environment to make it more comfortable for employees, and the employee remains with an internal feeling that he seriously wants to stay. The results showed that the training programs carried out by the bank have an impact on the intention to stay in the work by helping the employee, developing skills, improving abilities to perform the tasks assigned to him in a better way, helping to know and taking a lot of new information, and providing him with serious methods for better performance, this generates his ability to perform the duties assigned to him and thus remains attached to the organization and does not want to leave.

8 Recommendations

Based on the results, the study recommends that managers and decision-makers in commercial banks in Jordan invite employees in banks to share the information and knowledge provided by banks through the database and take the necessary decisions. Working on employees' systematic development knowledge, skills and attitudes required by the management of the study sample; In order to qualify them for the work, and in order to raise their production capabilities, or to work on providing them with the necessary skills that appear due to environmental and technical changes that require new skills. The study also recommends giving great attention to the internal communication of the study sample, which can lead to increased employee dedication, exchange and sharing of knowledge and skill, improve overall performance, and communication with the aim of providing a greater information understanding. And working to arouse employee's desire and intent with complete determination without any feelings of doubt to remain within the banks, which generates the desire to stay at work, a positive and comfortable feeling that the employee has towards a particular job or a certain environment.

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The Effect of Electronic Marketing on Customer Satisfaction of the Insurance Companies in Jordan

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Abstract This study aimed to identify the impact of electronic marketing on customer satisfaction of the insurance companies in Jordan, the researchers relied on the quantitative approach by the descriptive analytical method, A questionnaire was

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_123

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developed and distributed to (440) clients of insurance companies affiliated with the Jordanian Federation of Insurance Companies, which numbered (22) companies in Jordan. The study reached several results, the most important of which are: There is an impact of e-marketing on customer satisfaction, and the study concluded a number of recommendations, including: A focus on their website to be designed in an easy-to-use way and to provide all the required information about the company that pertain to the customer and the requirements of his transactions, leading to its progression more and more instead of regressing.

Keywords E-marketing · Customer satisfaction · Insurance companies · Jordan

1 Introduction

This era is witnessing a lot of developments in many fields; Perhaps the most important of them is technological development, as this development has led to differences in human needs on the one hand, and the growth of companies and their business management on the other hand, in addition to their reliance on electronic marketing, which has become widely used instead of traditional methods of marketing, which provides many services to customers and companies on both (Al-Hawary & Mohammad, 2011; Al-Hawary & Obiadat, 2021; Al-Hawary et al., 2011a, 2011b).

The insurance sector is one of the sectors concerned with customer satisfaction and loyalty; hence, it is necessary to use the best methods to reach them and provide the best services, especially insurance companies in Jordan, as they have tended to adopt electronic marketing to keep pace with the development of customers' needs and meet their desires in a more effective manner (Aburayya et al., 2020; Al-Dmour et al., 2021; Alshurideh, 2022; Alshurideh et al., 2012; Alzoubi et al., 2022; Kurdi et al., 2020). Insurance companies are concerned with the rights, duties, penalties and transactions of individuals. Individuals prefer to resort to insurance companies out of a sense of safety from any expected or actual damage; As a result of vehicle accidents, fire, theft, and others, which are circumstances beyond their control, insurance comes with the least losses to the customer. The insurance also preserves the relations between members of society from conflicts and disagreements as much as possible.

Insurance companies seek to know the extent of customer satisfaction with their services provided to him, especially with the increase in competition, so they try to adopt everything new to improve customer satisfaction (Allozi et al., 2022; Alzoubi et al., 2020; Sultan et al., 2021). E-marketing may play an important role in gaining customer satisfaction, which is one of the important indicators of the success of that organization and enhancing its market share (Al-Khayyal et al., 2021; Alshurideh, 2019; Alshurideh et al., 2021). Through the review of the previous studies, it became

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clear that there is a dearth of studies that dealt with the issue of the impact of electronic marketing on achieving customer satisfaction in the insurance sector in developing countries, including Jordan. The study also attempts to verify the extent to which electronic marketing is employed in the insurance sector in Jordan, and to reach customer satisfaction in order to meet their needs and satisfy their desires in conducting their transactions and the procedures followed. It will also help decision makers in the insurance sector to take the best means and channels used in e-marketing. Therefore, this study attempts to study the impact of electronic marketing on customer satisfaction for insurance companies in Jordan.

2 Theoretical Framework and Hypothesis Building

2.1 Electronic Marketing

Electronic marketing has the largest share in the field of marketing compared to traditional marketing, and with the passage of time and the communications revolution and the tremendous development in technology, electronic marketing has become of great importance in the business sectors as a whole, and it is the cornerstone in order to increase its market share (Al-Hawary & Alhajri, 2020; Al-Hawary & Hussien, 2017; AlHamad et al., 2022). E-marketing is the latest way to promote goods and services, and companies have to find a direction in order to follow up on the buyer's requirements and know their opinions (Alwan & Alshurideh, 2022; Tariq et al., 2022a, 2022b). However, this creates competitive capabilities for them, enabling them to achieve a competitive advantage that would increase their market share and thus provide the best products of goods and services at competitive prices and fast services, and quality (Al Kurdi & Alshurideh, 2021; Al-Hawary et al., 2011a, 2011b; Aljumah et al., 2021).

There are many concepts of e-marketing by different researchers, this is due to the multiplicity of electronic technologies that can be used in building electronic marketing and the methods and forms that it may take, but they are similar in their content. Electronic marketing has been defined as: the use of a market without being governed by local or temporal behaviors, so that the Internet is used as a platform for institutions to adapt to the needs of customer while minimizing costs (Al-Hawary & Al-Menhaly, 2016; Al-Hawary & Al-Smeran, 2017; Watson et al., 2002). Tawfiq and Omar (2020), see it as a technology of change because it witnessed transformations in the philosophy and applications of marketing, as it is an activity that uses media technology, especially the Internet, to market products of goods and services without direct contact. Accordingly, e-marketing can be considered as a group of activities managed through electronic tools and technologies provided by the Internet at a low cost, less effort and a shorter time than in traditional marketing, with the aim

of achieving common interests between organizations and individuals within well-studied strategies to reach the desired goals and required visions (Al-Hawary et al., 2013; Al-Nady et al., 2016; Alshurideh et al., 2016).

The importance of e-marketing lies in the fact that it is a double relationship between the seller and the buyer, as e-marketing addresses many of the problems of traditional marketing, especially with regard to crowded markets and the remoteness of the site. It has become possible to access goods and services without having to leave the house, with the opportunity to get to know what the customer wants before buying and what is being traded in the market for goods and services on the one hand, On the other hand, organizations and stores work to deliver products of goods and services to the consumer wherever he is through networks of advanced delivery systems and through systems supporting e-marketing, and e-marketing helps to support any new product or commodity in its various stages, e-marketing is one of the electronic works within a group of the businesses that constitute an integrated approach, such as production, finance, human resources, research and development, and information technology, which led to the establishment of the so-called electronic economy (Al-Hawary & Abu-Laimon, 2013; Al-Lozi et al., 2017, 2018; Alkalha et al., 2012; Alshurideh et al., 2022; Shamout et al., 2022).

One of the main goals of organizations is to reach customers in easy ways, communicate with them and know their needs and desires constantly, and provide them with the best products and services. This is not done in electronic marketing except through tools that provide many advantages; Such as low cost, and reduces the time to complete operations (Al-Hawary, 2013, 2015; Al-Hawary & Al-Syasneh, 2020; Al-Hawary & Alwan, 2016). Therefore, organizations resort to taking benefit of the advantages of electronic marketing tools and its role in developing the relationship with customers, communicating with them and maintaining them in the long term, by achieving value for them. This study also shows the most important of these tools as follows:

E-mail: E-mail is one of the tools that has kept pace with change well. E-mail marketing has become one of the largest platforms for successfully and profitably marketing products and services. One of the most important companies that use e-commerce to increase purchases of their products is Amazon (Al-Masaeed, 2021).

Website design: The first step that organizations which rely on the Internet is to design a website, with amazing technical methods and characteristics; So that it is a site that displays the strengths of the organization in its products and services, and the way of displaying the information in easy way to access for customers, companies offer through the site many benefits to customers such as pricing and means of payment, so organizations must ensure that it is of real benefit and not just a site that carries only name only.

Social networks: It is a set of Internet-based applications that rely on the ideological and technological foundations of the Web, which allow the creation and exchange of content as an important form of new media, social media has been dedicated to social interactions as well (Alshurideh et al., 2019; Khasawneh et al., 2021a, 2021b; Kurdi et al., 2021 Shen & Bissell, 2013).

Mobile applications: Mobile applications are meant as different mobile platforms running different operating systems in smart mobile devices, multimedia and communication functions as well as access to phones that support those systems (Sansour, 2016). Applications were the way to conduct the necessary transactions and procedures in insurance companies, especially during the period of the Corona pandemic, as the Jordanian Insurance Federation launched several programs, including "Safe in Your Car" and it was a program that prevents customers from mixing and crowding during the pandemic (JIF, 2021).

Internet advertisements: These advertisements are interactive between what the organization offers and customer reactions, with the least effort, cost and time period (Draz and Muslim, 2015). The interest in e-marketing has started in recent years remarkably, especially during the Corona pandemic, as insurance companies affiliated with the Jordan Insurance Federation adopted many tools to market their services electronically, as they launched the (Safe in Your Car) program, which was announced on their website and Facebook page. This program made the task easier for customers, protecting them from Corona at this time, so e-marketing was more successful in reaching the largest segment of customers and clarifying the program for all of them at the same time.

2.2 Customers' Satisfaction

Customer satisfaction is known through his reaction to the product. In marketing, customer satisfaction is the difference between the quality level of the product and his expectations. The organization must give it priority, since the customer and his satisfaction have a positive impact on profit and non-profit organizations, focusing on that, which was Satisfied the customer in the past, does not satisfy him today; This is due to the fluctuations of the market and its change, and the change of customers by what affects those around them (AlTaweel & Al-Hawary, 2021). Companies that follow electronic marketing in their transactions through Internet advertisements via websites must be characterized by credibility in the content of the advertisement first, and then complete an approach that suits the customer by providing information and supplying them with it to discover the characteristics of the product, whatever it is a good or service. Advertisement on unconventional rigid texts creates a type of entertainment that contributes to attracting the consumer, all of which is sufficient to gain customer satisfaction, and increases his purchase intention (Al-Hawary et al., 2011a, 2011b; Google, 2015; Shishan et al., 2022).

2.3 Electronic Marketing and Customer Satisfaction

The researchers dealt with the relationship between e-marketing and customer satisfaction in important economic, service and industrial sectors, where Mahmood &

Mahmood (2021) found a positive impact of e-marketing dimensions in achieving customer satisfaction of the Iraqi Oil Distribution Company. As confirmed by Bizhanova et al. (2019) On the impact of electronic marketing on entrepreneurship, the researcher also found that the increasing digitization leads to serious problems for executives in the field of marketing, as they face growing, complex and rapidly changing markets that are out of their control, as a result, companies have realized these changes and how to deal with them, as Electronic marketing is used for the regular review, analysis, interpretation and promotion process**,** It helps create strong consumer and brand relationships through search engine optimization, promotion, email, mailing list, contextual advertising and advertising in social networks, all of which increase sales while facilitating the purchase of goods and services. The findings of the Nakra and Pandey study (2019) underscore the importance of assisting hospital administration, governments, and other organizations in formulating appropriate policy for the use of smartphones by healthcare professionals. To find out the impact of social media marketing activities, Khan (2019) conducted a study that confirmed that social media marketing activities significantly affect brand loyalty, purchase intentions, value awareness and brand awareness. Salehi (2018) also examined the impact of smartphone use on health care, and the investigation of the applicability of routine clinical smartphones, and it was found that (85%) of the participants, their smartphones contribute to improving the quality of health care communications and help clinicians to prioritize tasks among them. Al-Sharif and Nassraldeen (2017) explored the influence of branding on the relationship between social media marketing on customer satisfaction and emphasized the importance of social media dimensions on customer satisfaction. The study of Bekar (2016) in Turkey also added an emphasis on the impact of brand social media marketing on the intent to purchase fashion and emphasized the need for social media to convince customers of product excellence and thus influence their purchase intent. Based on the above, the study hypothesis can be formulated as follows:

There is a statistically significant effect of e-marketing on the satisfaction of insurance companies' customers in Jordan.

3 Study Model

See Fig. 1.

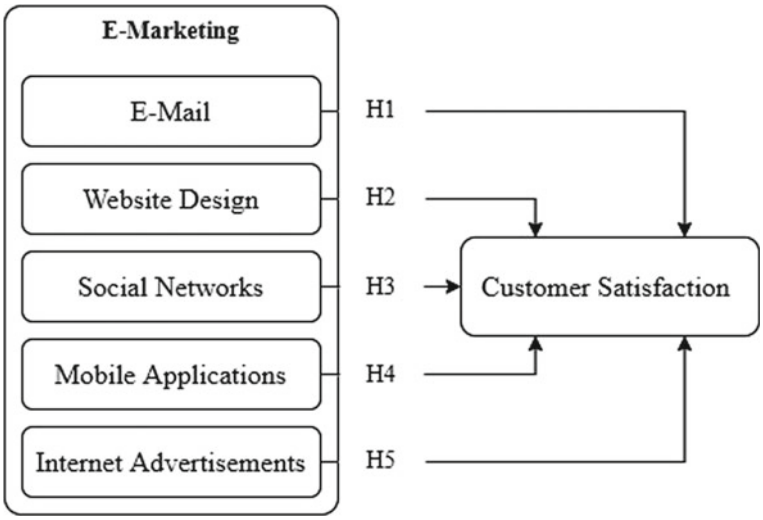

Fig. 1 Research model

4 Methodology

4.1 Population and Sample Selection

A qualitative method based on a questionnaire was used in this study for data collection and sample selection. The major aim of the study was to examine the impact of e-marketing on customer satisfaction. Therefore, it focused on Jordan-based companies operating in the insurance sector. Data were primarily gathered through self-reported questionnaires created by Google Forms which were distributed to a non-probability sample of companies' customers via email. In total, (463) responses were received including (23) invalid to statistical analysis due to uncompleted or inaccurate. Hence, the final sample contained (440) responses suitable to analysis requirements that were formed a response rate of (95%), where it proved to be sufficient to the extent that was predictable and allowed for a presumption of data saturation (Sekaran & Bougie, 2016a, 2016b).

4.2 Measurement Instrument

A self-reported questionnaire that consists of two main sections along with a section regarding control variables was used as the measurement instrument. Control variables considered as categorical measures were composed of gender, age group, educational level, and experience. The two main sections were dealt with a five-point Likert

scale (from 1 = strongly disagree to 5 = strongly agree). The first section contained (20) items to measure e-marketing based on (Gazi, 2020; Qtaishat, 2022). These questions were distributed into dimensions as follows: four items dedicated for measuring e-mail, four items dedicated for measuring website design, four items dedicated for measuring social networks, four items dedicated for measuring mobile applications, and four items dedicated for measuring internet advertisement. Whereas the second section included seven items developed to measure customer satisfaction according to what was pointed by (Al-Hawary & Harahsheh, 2014; Al-Hawary et al., 2017; Alolayyan et al., 2018; Alshurideh et al., 2017; Fan et al., 2021; Slack et al., 2020).

5 Findings

5.1 Measurement Model Evaluation

This study was conducted structural equation modeling (SEM) to test hypotheses, which represents a contemporary statistical technique for testing and estimating the relationship between factors and variables (Al-Adamat et al., 2020; Al-Gasawneh and Al-Adamat, 2020; Wang & Rhemtulla, 2021). Accordingly, the reliability and validity of the constructs were tested using confirmatory factor analysis (CFA) through the statistical program AMOSv24. Table 1 summarizes the results of convergent and discriminant validity, as well the indicators of reliability.

Table 1 shows that the standard loading values for the individual items were within the domain (0.674–0.873), these values greater than the minimum retention of the elements based on their standard loads (Al-Lozi et al., 2018; Sung et al., 2019). Average variance extracted (AVE) is a summary indicator of the convergent validity of constructs that must be above 0.50 (Howard, 2018). The results indicate that the AVE values were greater than 0.50 for all constructs, thus the used measurement model has an appropriate convergent validity. Rimkeviciene et al. (2017) suggested the comparison approach as a way to deal with discriminant validity assessment in covariance-based SEM. This approach is based on comparing the values of maximum shared variance (MSV) with the values of AVE, as well as comparing the values of square root of AVE ($\sqrt{}$AVE) with the correlation between the rest of the structures. The results show that the values of MSV were smaller than the values of AVE, and that the values of $\sqrt{}$AVE were higher than the correlation values among the rest of the constructs. Therefore, the measurement model used is characterized by discriminative validity. The internal consistency measured through Cronbach's Alpha coefficient (α) and compound reliability by McDonald's Omega coefficient (ω) was conducted as indicators to evaluate measurement model. The results listed in Table 1 demonstrated that both values of Cronbach's Alpha coefficient and McDonald's Omega coefficient were greater than 0.70, which is the lowest limit for judging on measurement reliability (De Leeuw et al., 2019).

Table 1 Results of validity and reliability tests

Constructs	1	2	3	4	5	6
1. E-mail	**0.762**					
2. Website design	0.524	**0.781**				
3. Social networks	0.481	0.405	**0.779**			
4. Mobile applications	0.449	0.556	0.492	**0.790**		
5. Internet advertisements	0.537	0.571	0.538	0.553	**0.768**	
6. Customer satisfaction	0.637	0.684	0.624	0.607	0.638	**0.757**
VIF	1.964	2.058	2.248	2.391	2.178	–
Loadings range	0.692–0.814	0.703–0.834	0.683–0.873	0.704–0.836	0.691–0.834	0.674–0.846
AVE	0.581	0.610	0.606	0.625	0.590	0.573
MSV	0.415	0.503	0.495	0.511	0.497	0.514
Internal consistency	0.845	0.859	0.855	0.866	0.848	0.899
Composite reliability	0.847	0.862	0.859	0.869	0.851	0.903

Note Bold fonts refers to root square of average variance extracted

5.2 Structural Model

The structural model illustrated no multicollinearity issue among predictor constructs because variance inflation factor (VIF) values are below the threshold of 5, as shown in Table 1 (Hair et al., 2017). This result is supported by the values of model fit indices shown in Fig. 1.

The results in Fig. 2 indicated that the chi-square to degrees of freedom (CMIN/DF) was 2.466, which is less than 3 the upper limit of this indicator. The values of the goodness of fit index (GFI), the comparative fit index (CFI), and the Tucker-Lewis index (TLI) were upper than the minimum accepted threshold of 0.90. Moreover, the result of root mean square error of approximation (RMSEA) indicated to value 0.051, this value is a reasonable error of approximation because it is less than the higher limit of 0.08. Consequently, the structural model used in this study was recognized as a fit model for predicting the DEP and generalization of its result (Ahmad et al., 2016; Shi et al., 2019). To verify the results of testing the study hypotheses, structural equation modeling (SEM) was used, the results of which are listed in Table 2.

The results demonstrated in Table 2 show that all e-marketing dimensions had a positive impact relationship on customer satisfaction except website design ($\beta = -0.029, t = -0.0568, p = 0.571$). On another hand, the results indicated that the highest

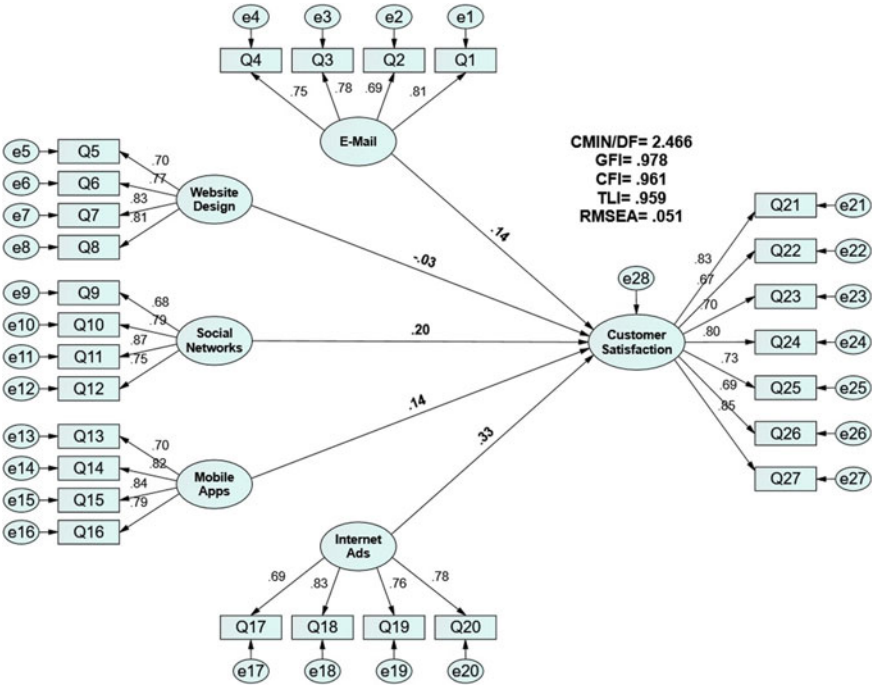

Fig. 2 SEM results of the e-marketing effect on customer satisfaction

Table 2 Hypothesis testing

Hypothesis	Relation	Standard beta	*t* value	*p* value
H1	e-mail → customer satisfaction	0.143	2.880	0.004
H2	website design → customer satisfaction	−0.029	−0.568	0.571
H3	social networks → customer satisfaction	0.203	3.826	0.000
H4	mobile applications → customer satisfaction	0.141	2.602	0.010
H5	internet advertisements → customer satisfaction	0.332	6.373	0.000

Note * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

impact was for internet advertisements ($\beta = 0.332$, $t = 6.373$, $p = 0.000$), followed by social networks ($\beta = 0.203$, $t = 3.826$, $p = 0.000$), then e-mail ($\beta = 0.143$, $t = 2.880$, $p = 0.004$), and finally the lowest impact was for mobile applications ($\beta = 0.141$, $t = 2.602$, $p = 0.010$). Thus, most the minor hypotheses of the study were supported based on these results.

6 Discussion

The results of the analysis revealed that there is an impact of electronic marketing on customer satisfaction of the insurance companies in Jordan, and this result may be due to the fact that electronic marketing help insurance companies to manage their marketing programs and ways of presenting their advertisements to customers to display their services in line with customers' needs and desires and to deal with them easily. And this is what most companies aspire to marketing their products through the Internet, which is now occupying the world with its electronic services, more than traditional marketing. It was also found that there is an impact of e-mail on customer satisfaction of insurance companies in Jordan. The results of the analysis indicated that e-mail is a safe tool for collecting information related to insurance company customer, who preserves the privacy of customers compared to other marketing tools, and e-mail allows more interaction between the insurance company and its customer with recent electronic publications quickly**.** It was also found that there is no statistically significant effect of website design on customer satisfaction of the insurance companies in Jordan. This result is due to the fact that the website is designed in a somewhat complex manner and is not easy to use by customers, and this makes insurance companies reconsider their website and design method; In order to make it serve customers better, and perform the goal for which it was designed more, the site must be easier and more attractive to customers, and this result agrees with the study of Al-Sabbagh.

The results of the study showed that there is an impact of social networks on customer satisfaction of the insurance companies in Jordan, and this result may be due to the fact that social networks are characterized by always sticking to customers; Therefore, insurance companies have found that these networks are an excellent platform to reach customers easily to market their services and manage their dealings with customers, and insurance companies publish on social networks as a media about their activities and events for their customers, and this result is consistent with Al-Sharif and Nassraldeen (2017). The results of the data analysis added that there is an impact of mobile applications on the satisfaction of insurance companies' customers in Jordan, and this result is due to the fact that the use of mobile applications saves time and effort, especially if they are effectively managed as insurance companies do, as they rely on social networks as a marketing tool to market its services to customers, and this is what the customer prefers, especially if those applications are easy to use, and this result agrees with Salehi (2018) and Nakra and Pandey (2019). The results of the study add that there is an impact of Internet advertisements on customer satisfaction of the insurance companies in Jordan, and this result may be due to the fact that Internet advertisements via social networks help in choosing the appropriate service for customers to conduct insurance in the appropriate manner, and whenever the advertisement online is continuously updated and in a timely manner, whenever it is a tool that targets the desired customers, and directs their behavior towards the concerned institution well, and the result agrees with Al-Sharif and Nassraldeen (2017).

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7 Recommendations

In light of the findings of the study, the study recommends that insurance companies need to constantly develop their tools used in electronic marketing, keep pace with contemporary updates for each of them, and link all insurance companies affiliated with the Jordanian Federation on one website, with a focus on being designed in an easy-to-use way and providing all information Required about the companies that pertain to the customer and the requirements of his transactions, the study also recommends employing mobile applications to send notifications of its activities to customers constantly and at the appropriate times in order to achieve the desired goal, and not be satisfied with the programs used, but rather convert them into applications used through smart phones. Finally, insurance companies should intensify their advertisements on various social media sites, promote them to reach the largest segment of customers, and work to intensify control on the insurance companies' website, to check the information presented about the insurance company and the service provided, and to ensure that it matches reality.

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Share Your Beautiful Journey: Investigating User Generated Content (UGC) and Webrooming Among Malaysian Online Shoppers

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Abstract The electric commerce (e-commerce) platform in Malaysia has been growing exponentially since the spread of Coronavirus Disease 2019 (COVID-19) pandemic. Many local businesses were badly affected when the first phase of Movement Control Order (MCO) was implemented for several weeks. The increasing number of social media platform users stems from wide internet accessibility and smartphone ownership. As such, this study investigated online purchasing behaviour in Malaysia by linking webrooming and user generated content (UGC) with brand experience and brand engagement. Essentially, this study unravelled consumer purchasing behaviour during the COVID-19 pandemic. This study explored the effects of UGC and webrooming on brand experience and brand engagement among

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_124

Malaysian online consumers who purchased beauty product. As a result, UGC and webrooming displayed positive correlation with brand experience. However, brand experience was insignificant for brand engagement. Additionally, brand experience was unsuitable to function as a mediator. Thus, the impact of social influencers and shoppertainment on brand engagement should be assessed. Future studies may look into webrooming from the light of Stimulus-Organism-Response (SOR) Theory. Lastly, fake reviews, fake accounts, and bots that influence online purchasing behaviour among Malaysians should be investigated as well.

Keywords E-commerce · Online shopping · User generated content · Webrooming · Brand experience · Brand engagement

1 Introduction

With higher digital service awareness and easier access to internet connectivity, online shopping becomes a norm and disregards the traditional brick-and-mortar retail outlets that demands engagement with customers. Customers have taken a liking and have been adapting rapidly the online shopping model due to its ease of use, flexibility, controllable, and reference to rich information prior to making a decision to purchase tangible or intangible service or goods. Online shopping has been progressing since the past two decades, while simultaneously improving automated processing, ordering system, and integrated logistics companies that offer customers seamless purchase experience at a minimum cost.

The Malaysian government is a supporting pillar that drives the growth of electric commerce (e-commerce) business, whereby customers have been actively purchasing online for various products and services over the years. The Malaysian Department of Statistics reported higher adoption rate of e-commerce in 2019 than the previous years with double-digit growth. As stated in the Usage of Information and Communication Technology (ICT) in 2020 report, higher percentages of business-to-business (B2B) rates were recorded at 13, 53, and 22.6% from 2017 to 2019 (Department of Statistics Malaysia, 2021). This was due to the surge in ICT consumption and availability of internet access, which encouraged the growth of e-commerce amidst local and global players. A statistical study conducted by Hootsuite in 2019 identified some top-rated products purchased online, including fashion and beauty items, electronics, and sports-related products. The growing preference to shop online was motivated by consumers' perception that vast information is available, which aids or facilitates the decision-making process.

The COVID-19 pandemic has immensely affected everyone worldwide, particularly the retail industry ecosystem. A study forecasted the closure of 20,000 high street retail outlets in the UK due to the COVID-19 lockdown. During the troubled period of COVID-19 pandemic from 2020 to 2021, consumer behaviour was driven more towards e-commerce or online purchase, thus exerting drastic changes to and impacts on businesses across the globe. Businesses with e-commerce facility may

reap benefits, while those without any online facility are bound to suffer from loss unless they urgently adapt to change. With higher online shopping adaption, more Malaysians have begun adopting the spending habit during the lockdown period. The surge in Malaysian online spending is due to work at home and more consumption of time online with better internet accessibility.

The Malaysian government has extensively facilitated local businesses to venture into e-commerce. Interestingly, many local businesses are positively forced to change their nature of selling into e-commerce and social media. A recent study showed that 76% of Malaysians paid additional 5% premium on the product for value, convenience, and benefits. Online shopping helps them to purchase products without the hassle of going out and getting infected by COVID-19. Therefore, it is imminent to investigate the factors that influence Malaysian consumers to purchase online and to understand how consumers engaged with the community via social media platform.

2 Study Importance and Objectives

The e-commerce platform in Malaysia has grown rapidly due to the COVID-19 pandemic. In the beginning, the local businesses had problems in their operation during the first phase of Movement Control Order (MCO) implemented for several weeks. Such scenario had forced the local businesses to invest in e-commerce, thus driving consumers to purchase online. Statista in 2021 reported that the most clicked e-commerce platform in Malaysia 2020 was Shopee, followed by Lazada, PG Mall, Zalora, eBay, GoShop, Lelong, Sephora, Wowshop, and Applecrumby. Furthermore, 91% of Malaysians appeared to be avid users of the internet with high rate of smartphone consumption. The e-commerce platform is favourable among Gen Y and Gen Z (Muda et al., 2016) mainly because online purchase has become easier, faster, and more transparent. These younger generations are adopting shopping as a lifestyle and as an escapism mechanism from their daily routine. They would spend longer time and money to shop online. Besides, Malaysians working at home are expected to spend more as stated by Pricewaterhouse Coopers (PWC) in 2021. A survey by Rakuten Insight in 2020 reported that Malaysia imported beauty and skincare products from France ($67.6 million), followed by the US and South Korea. Hence, it is crucial to decipher the behaviour of Malaysian consumers who purchase beauty products via online platform.

The social media has grown into a platform to gather information about goods and services (Department of Statistics Malaysia, 2021). Internet consumption has changed as more consumers are spending more time using video, messaging applications, and social media platform. This paradigm shift has continued to increase as more Malaysians practice social distancing stated by PWC in 2020 and work from home. More people are exploring the social media due to the COVID-19 pandemic. Malaysians use social media to conduct product research based on reviews, feedback, and comments as stated by Malaysian Communication and Multimedia Commission (MCMC) in 2020 Mostly, individuals use the social media to interact, engage, and

share brand experiences about a particular product. At present, people are getting more creative in developing their own contents and sharing them widely on the social media platform. The increasing number of users using the social media platform is a result of better internet accessibility and smartphone ownership (Arif et al., 2020). Therefore, more people rely on user generated content (UGC) as reference before purchasing as they feel that the information shared on social media is trustworthy and credible. They believe more in the experience of other consumers, instead of the e-commerce platform due to lack of trust, security, and confidence. As suggested by Herrero et al. (2015), more studies should assess the synergy between credibility of a source and worthiness of information on consumer behaviour. Additionally, it is important to decipher the videos and contents generated by users that influence purchasing decision.

In reference to consumer research online prior to purchase, webrooming has an important role in the decision-making process. About 70% of consumers worldwide had conducted product research online before purchasing as stated by PWC in 2015. With the expansion of smartphones and internet, webrooming is becoming favourable among consumers. While many consumers visit the e-commerce platform (e.g., websites & social media) prior to purchase decision making, studies on this research area are in scarcity (Arora & Sahney, 2019; Flavián et al., 2016). Hence, it is crucial to investigate the importance of UGC and webrooming variables in the context of purchasing online beauty products by Malaysians.

This study assessed the online purchasing behaviour in the context of Malaysians by linking webrooming and UGC with brand experience and brand engagement during this COVID-19 pandemic. The objectives of this study are listed in the following:

1. To investigate factors that influence brand experience that lead to brand engagement through SOR Theory
2. To analyse the mediating effect of brand experience and brand engagement
3. To explore the direct relationship between user generated content (UGC) and brand engagement
4. To examine the direct effect between webrooming and brand engagement.

3 Literature Review

3.1 SOR Theory and Brand Experience

Brand experience refers to one's experience interacting with a product or service through brand-related stimuli that evokes emotions, such as pleasure, arousal, dominance, and intelligence. In return, such emotions alleviate the brand value. Notably, brand experiences are "sensations, feelings, cognitions, and behavioural responses evoked by brand-related stimuli that are part of a brand's design and identity, packaging, communications, and environments" (Brakus et al., 2009).

The SOR Theory introduced by Mehrabian and Russell (1974) enables the investigation of cognitive and effective impacts on consumer behaviour. The underlying dimensions of SOR are stimuli, organism, and response. Stimuli denote the external factors that stimulate one's evaluation. Organism reflects the internal emotions derived from environment stimuli. Response is the final consequence if one should approach or avoid certain behaviour. Turning to this present study, the SOR Theory was deployed in the Malaysian online shopping scenario due to the limited studies in doing so.

The fundamental of the SOR Theory is to identify consumer emotions that influence consumer response (Ha & Lennon, 2010) such as purchase intention (Giovanis et al., 2014). Consumers who experience positive emotional state have the tendency or willingness to purchase**.** However, more researchers need to investigate the environmental cues that may influence brand experience quality, especially in e-commerce landscape. With the context of experience, it is essential to measure the emotional scale in response to environmental stimuli. Based on the literature gaps, more studies are required to examine environmental cues that evoke brand experience quality. Therefore, this study assessed the effect of environmental stimuli (UGC and webrooming) on brand experience using the SOR Theory. In reference to this present study, brand experience reflects a customer's experience influenced by virtual experience, which in turn, affects their online engagement towards online communities, such as Facebook and Instagram. Brand experience elements have three basic dimensions of emotions, namely pleasure, dominance, and arousal, in responses to environmental stimuli (Mehrabian & Russell, 1974). It is crucial to decipher the effect of webrooming and UGC on brand experience towards brand engagement.

3.2 Webrooming

Webrooming is a process of product information seeking behaviour by consumers via online channels, continued by verification of information, and finally, the actual purchase at physical stores (Aw et al., 2021). Webrooming denotes consumers gathering information about a product from online platform, but the real purchase happens in a physical store (Pimentel et al., 2019).

Many studies have assessed the role of webrooming and other factors in strengthening certain behaviour (Herrero-Crespo et al., 2021). The four drivers linked with webrooming are psychographic, shopping motivation, channel-related, and product-related variables (Kleinlercher et al., 2020). The literature depicts a broad range of reasons on why consumers webroom. Webrooming helps consumers minimise the risks of buying products online (Chiu et al., 2011).

Consumers webroom to gain information from the online platform by reading online reviews in order to make clearer and better choices. This decrease worries that one would feel in process of online purchase (Flavián et al., 2016). Webroom boosts selection trust and confidence towards purchasing products from physical stores as a result of gathering product-knowledge via reviews accessible online. Some

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consumers webroom to limit their selection before purchasing products from physical stores (Wolny & Charoensuksai, 2014). The webrooming behaviour is conceptualised only lately (Arora & Sahney, 2019; Aw, 2020) and the academic research on this concept is still in its infancy stage.

Flavián et al. (2019) emphasised on the importance of expanding approaches to enhance consumer confidence especially when it comes to purchase process. Studies have highlighted those marketers should seek to improve consumers' participation and engagements towards brand, product, and proses situation. The proses situation is associated with emotional attachment to the representational meaning of purchase (Balasubramanian et al., 2005) that leads to consumer confidence in purchase selection. Based on data retrieved from 302 customers in Hong Kong, (Cheung et al., 2020) found that ongoing information search behaviour by consumers is the key driver of brand engagement. They verified the role of enduring involvement to improve continuous search behaviour and brand engagement. Consumer brand engagement and the importance of customer involvement is based on the argument that consumers are more likely to be engaged, to expend more cognitive effort, and to participate more resources in ongoing information search about their product selection.

According to Flavián et al. (2016), consumers webroom to acquire information online, while the contrary was reported by Phan et al. The latter found that information readiness was insignificant for brand engagement. Consumers actively participate in multiple brand-related activities to satisfy their individual needs. Consumers' utilitarian benefits are related to information availability. According to Chahal and Rani (2017), customers are engaged with a brand more likely to satisfy their demands. Rohm et al. (2013) stated that product information expands customers' connection, such as social media and engagement with brands (brand engagement).

According to Aw (2020), Shankar and Jain (2021), studies on webrooming behaviour trend is in its initial stages. Thus, this present study assessed the links among webrooming, UGC, brand experience, and brand engagement in the Malaysian online shopping context.

3.3 User Generated Content (UGC)

Social media platform, such as Facebook, Instagram, and Snapchat, offer an outlet for companies to expand their successful brands. The UGC has gained popularity among online users as companies recognise the importance of UGC to engage with costumers. This development has urged many studies to reveal the more significant relevance of digital platform (e.g., Instagram & Facebook) when compared to conventional marketing (Oliveira & Casais, 2019). The present trend shows that consumers spend more time on UGC and create contents, such as videos, reviews, and attractive images, to be shared online, as well as gain more followers and popularity. Some online consumers explore the social media platform to become social media influencers.

As marketers acknowledge the importance of UGC in social media, they provide limitless opportunity for social media users to share videos, post photos, and leave comments about their experiences consuming a particular product (Raji Ridwan et al., 2017). Interestingly, the e-commerce platform offers UGC features, such as review, rate, and comment sections, for users to share their brand experience. This valuable tool influences consumers in future purchasing decisions as they gather content at the platform. Lazada Malaysia, for instance, provides these features that allow consumers to share UGC with the community. This helps the e-commerce platform to gain confidence from consumers, which in turn, generates higher sales.

The advent of social media has changed the dynamics of disseminating information. The UGC was designed as a new type of brand communication for companies. In order to maintain the UGC (content) quality, marketers constantly monitor their content from malicious comments and negative content by unanimous users (Kim et al., 2012). The UGC platform serves as a marketing tool managed by influencers or marketing team. Marketers and influencers use their social media platform to target a specific target market, such as Tiktok among Gen Z and Gen Alpha. Thus, it is imminent to investigate the behaviour of young generations towards UGC usage as their avenue. Essentially, it is timely to unravel the influence of UGC on brand experience and brand engagement among young savvy Malaysians who indulged in online purchasing activities.

3.4 Brand Engagement

A brand is no longer what customers are told, but it is what the customers are telling themselves. The use of a combination of social media for marketing has never been more important than the present time. Generally, branding consists of several perception concepts, namely perceived knowledge and attitude, where assessment of consumers' perceptions is integral for they shape their brand attitudes (Hollebeek, 2011). Consumer brand experience is a critical factor for a business to succeed in the social media setting. The branding process has been the subject of a great deal of scientific debate since the past few decades (Kramoliš & Kopečková, 2013). As products and services have their lifecycles; consistent quality, credibility, and experience are vital.

Brand is a value and many businesses automatically add brand to their balance sheets due to its positive association. Creating a brand as a 'trademark' is not just applying a logo or graphic, mainly because brand blankets the overall customer experience. It is inevitable to track and talk about brand experience, as a good and strong brand does not flow from each other (Wroblowská, 2016). Brand creation is important in the online environment (Hollebeek et al., 2014) because the social media make brand more visible and available. Strategic branding work ensures customers have positive feeling towards a brand in their experience.

Past studies have established that brand leads to purchase intention (Chou et al., 2016). The famous the brand; the higher the tendency for customers to purchase

the brand due to the trust they have built towards the brand (Chou et al., 2016). As such, the brand becomes the first choice during purchase process. Brand has been extensively linked with loyalty. Loyalty has turned into the goal for each brand in the market because retaining the existing customers is easier than seeking new. According to Hollebeek (2011), customers who are loyal to a brand will influence others to try out the offer and share similar feeling and experience.

During this period of transition and adjustment to the digital economy, a new marketing approach is sought to help marketers anticipate and capitalise on disruptive technology platforms to increase brand engagement of skincare product. Does brand continue to play a critical role in engaging with customers? According to Kotler et al. (2017), globalisation breaks down the boundaries between large and small businesses. To date, new, smaller, younger, and local businesses can compete with the biggest, the oldest, and global companies with strong brand.

Instead of being highly dominating, a company is more competitive if it can connect with client and partner communities for co-creation, as well as with competitors for co-operatives. In the past, companies believed that innovation should spark from brand support, while focusing on research and market development (Kotler et al., 2017). Consequently, they realised that in-house innovation rate was insufficient to compete in a constantly changing market. Procter & Gamble (P&G), for example, found out in early 2000 when its sales of new products flattened out. Next, the company turned its R&D model into a connection-development model. This also happened to Unilever, which evolved in the same direction where innovation is now horizontal, where the market generates ideas and the companies commercialise idea. Such new internal strategy builds positive or negative brand experience, thus leading to brand engagement. This study established the much-sought links of UGC, webrooming, and brand experience with brand engagement on social media in order to identify the path to engage customers with skincare product brands.

4 Theoretical Framework

The Stimulus-Organism-Response (SOR) Theory was implemented in this study as it assessed organisational characteristics (e.g., UGC & webrooming) as stimuli and responses (e.g., brand experience & brand engagement). The SOR Theory initiated by Woodworth in 1929 incorporated stimuli (S)—response (R) characters. (Mehrabian & Russell, 1974) expanded the theory by inculcating organism (O) human cognitive and affective elements that influence the stimuli response ecosystem. Scholars, including (Musa et al., 2020; Wang et al., 2020), who adopted the SOR Theory had explored the social media setting. Nonetheless, only a handful of studies have assessed webrooming (Arora & Sahney, 2017; Flavián et al., 2016). Very few UGC studies (Arif et al., 2020; Mohammad et al., 2020) had assessed emotional and functional elements in social media during COVID-19 pandemic.

Accordingly, this study investigated the SOR Theory within the online beauty industry in the context of Malaysia. Figure 1 illustrates the conceptual framework

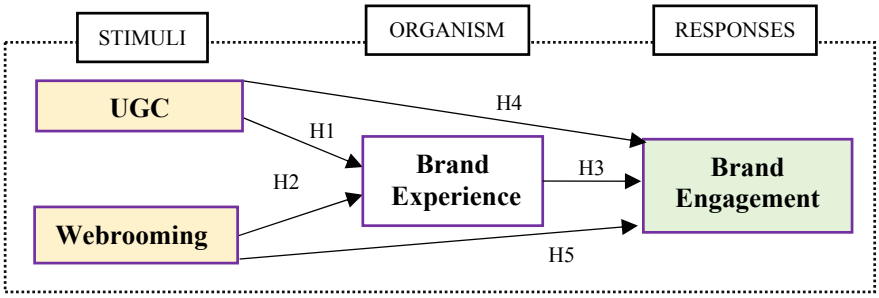

Fig. 1 Conceptual framework

adapted from Mehrabian and Russell (1974), Wan Nadiah Mohd Nadzri (2017). This present study has incorporated new variables to suit the COVID-19 pandemic context. Despite the past studies on consumer online purchase behaviour, more studies have recommended to investigate the SOR Theory within the beauty industry.

5 Formation of Hypotheses and Constructs

The growing demand for shopping online by Malaysians is driven by accessible internet, high smartphone usage, and boundless information that aid consumers to make decision prior to online purchase. Malaysians love to indulge in online purchasing as they spend longer time browsing through the vast social media platform during the pandemic. The pandemic has changed the consumers' purchase pattern as they continue to work remotely from home. Consumers have more time to conduct online research by referring to reviews, videos, and stories posted across the social media platform. Influential information can entice consumers to purchase a particular product. Thus, it is relevant to unravel elements such as UGC (H1) and webrooming (H2). A well-researched consumer will influence brand experience (H3) that leads to brand engagement. Consumers willingly share authentic recommendations to online communities (H4) in order to build brand engagement. Website browsing, such as webrooming (H5), may influence consumers to share their experiences by engaging with communities. Hence, the following hypotheses are proposed:

H1: User generated content is positively related to brand experience.
H2: Webrooming is positively related to brand experience.
H3: Brand experience is positively related to brand engagement.
H4: User generated content is positively related to brand engagement.
H5: Webrooming is positively related to brand engagement.

6 Research Methodology

This study explored the effects of UGC and webrooming on brand experience and brand engagement among Malaysian online consumers purchasing beauty products. Brand experience served as the mediator to inculcate several elements, such as pleasure and intelligence. Figure 1 shows consumer affective and cognitive characteristics in brand experience that trigger consumer brand engagement.

Since a large sample size of Malaysian online consumers was selected for this study, the non-probability sampling technique was deployed as the respondents were not given an equal opportunity to participate (Etikan & Bala, 2017). Data were collected from Malaysians experienced in using the social media platform or e-commerce to purchase beauty products. Malaysians are a technology savvy society and are highly influenced by social media, particularly online shopping (Mohd Fudzi et al., 2021). The respondents must be users of smartphone and had internet access. Hence, the purposive sampling method was employed. Due to MCO restriction and social distancing, the questionnaire was distributed via online using Google Form in English version. Although the suitable sample size for this study is 250, 276 usable questionnaires were used based on the study by Mohd Fudzi et al. (2021) that involved 267 Malaysians who purchased online.

The questionnaire has two sections: Section A emphasises on items that measure UGC, webrooming, brand experience, and brand engagement. Section B focuses on demographic information, such as gender, age, and education level. The respondents were required to rate their disagreement or agreement on a seven-point Likert scale ranging from 1 = Very strongly disagree to 7 = Very strongly agree; adopted from Mohd Nadzri (2017). The UGC was measured based on Kim et al. (2012) webrooming was obtained from Vasudevan and Arokiasamy (2021), while brand experience and brand engagement were adopted from Bansal et al. (2005). The next step was data collection and analysis using software. The outcomes are presented in the next section.

7 Research Findings

This section explains the three stages of findings derived from descriptive, measurement model, and structural model analyses. In light of descriptive analysis, most of the respondents were females (87%) at the age of 18–30 years old (74.6%). They were mostly single (78.3%) and possessed a Bachelor's Degree (55.1%). As for beauty products, the respondents mostly purchased toner, serums, and moisturisers (66.7%) via online platform. Interestingly, the respondents referred to Instagram (70.3%) to gather information prior to purchase. The details are tabulated in Table 1.

The data were analysed using IBM SPSS and Smart PLS version 3. The results showed that the data did not have multivariate normality based on Mardia's multivariate skewness ($\beta = 2.667$, $p < 0.01$) and Mardia's multivariate kurtosis ($\beta = 30.86$,

$p < 0.01$), as extracted from IBM SPSS. The results of multivariate skewness and kurtosis were assessed as prescribed by Nadzri and Musa (2017), Hair et al. (2017). The link is given in the following:

- https://webpower.psychstat.org/models/kurtosis/results.php?url=fb9771ad65087c96bdc6a313929fa338

Smart PLS is a non-parametric software analysis and is beneficial for studies that have relatively large or small sample size (Hair et al., 2011). Besides, Smart PLS is suitable for studies with limited theory available in the literature, as the case of this present study. In order to analyse the research model, two steps of analytical procedure were executed (Anderson & Gerbing, 1988). In Step 1, the measurement model was assessed to investigate convergent validity and discriminant validity. Next, Step 2 assessed the structural model that tested the formulated hypotheses. In order to identify the significance of path coefficient of each construct and its loadings, the bootstrapping method was performed with 5000 resamples as suggested by Hair et al. (2017).

7.1 Measurement Model Analysis

The measurement model was analysed for its convergent validity and discriminant validity. As depicted by Nadzri and Musa (2017), convergent validity examines average variance extracted (AVE), loadings, and composite reliability. Based on Table 2, both loadings and composite reliability exceeded 0.708 (Nadzri & Musa, 2017), except for several loadings. The items were not deleted as they affected both AVE and composite reliability of the variables. The AVE for all constructs exceeded 0.5, as prescribed by Nadzri and Musa (2017), Hair et al. (2017).

Table 3 tabulates the discriminant validity for this study based on Fornell and Larcker (1981) although several studies Henseler et al. (2016) criticised its reliability in analysing discriminant validity while prescribing the Monte Carlo simulation. Table 4 shows the HTMT values below HTMT0.85 value of 0.85 (Kline, 2011) and HTMT0.90 value of 0.90 (Ramayah et al., 2017). Thus, there was no discriminant validity issue using (Fornell & Larcker, 1981) in this present study.

7.2 Structural Model Analysis

The last step was analysing the structural model. To test the model fitness, Normed Fit Index (NFI) and Standardised Root Mean Square Residual (SRMR) were deployed. The model displayed SRMR = 0.064 that indicated good fit as the value is below 0.08 (Hair et al., 2011). The value of NFI that exceeds 0.9 represents acceptable fit.

In assessing the structural model, a bootstrapping procedure with 5000 resamples (Hair et al., 2017) was conducted to investigate R^2, beta (β), and t-value (see results

in Table 5 and Fig. 2). Table 5 presents the results of UGC ($\beta = 0.259$, $t = 3.334$, $p < 0.01$), webrooming ($\beta = 0.619$, $t = 9.220$, $p < 0.01$), and brand experience ($\beta = 0.069$, $t = 0.522$, $p > 0.01$). Referring to Table 6, brand experience was unsuitable to serve as a mediator for the following links: UGC → Brand Experience → Brand Engagement, and Webrooming → Brand Experience → Brand Engagement. However, no direct effect was noted for Hypothesis H4 (UGC → Brand Engagement), while Hypothesis H5 (Webrooming → Brand Engagement) exhibited a direct relationship.

8 Discussion and Conclusion

In reference to descriptive analysis, most of the respondents were 18–30 years old Malaysians literate in technology and social media. A similar age pattern was also reported by Arora and Sahney (2018). Generation Alpha (born 2010–2025) and Gen Z (18–25 years old) are inclined to be proficient in technology (Karasek & Hysa, 2020). Interestingly, these generations cannot function well daily without digital technology or social media platform. Despite their efficiency in researching information via online, these young generations face problem focusing on a specific activity (Grenčíková & Vojtovič, 2017). The behaviour of Gen Z and Generation Alpha promotes online shopping and e-commerce as they serve as a crucial marketing segmentation strategy.

This study assessed the impact of webrooming and UGC on brand experience towards brand engagement. It also investigated the direct relationship between UGC and webrooming towards brand engagement, as reflected in Hypotheses H4 and H5. As a result, UGC displayed a positive relationship with brand experience. Similarly, (Arif et al., 2020; Cheung et al., 2020) reported that UGC influenced emotion response towards consumers' decision-making process. Emotional responses, such as pleasure and intelligence, triggered Malaysians to share their experiences with their family and friends. However, UGC exerted a negative impact on brand engagement in this present study. This contradicts with that reported by Yasin et al. (2020), in which brand engagement positively impacted UGC. The result retrieved in this present study revealed that the customers were overwhelmed by the massive information retrieved from reviews, testimonials, tutorials, and videos. Additionally, fake news or irrelevant information that circulated across the social media platform affected the consumers' decision-making process. However, irrelevant or fake information was seldom shared due to fear of spreading unauthentic facts that may get them in hot water by the Malaysian Communications and Multimedia Commission (MCMC). The existence of fake reviews, fake accounts, bots, and fake content can adversely affect company revenue (Katona, 2018).

In this study, webrooming exhibited a positive impact on brand experience. Similarly, Aw (2020), Hollebeek et al. (2014), Shankar and Jain (2021) highlighted that webrooming behaviour can lead to purchase intention. However, only a handful of studies have assessed webrooming and brand experience. Turning to this present study, most consumers preferred gathering information directly from website as

65.9% of the respondents relied on e-commerce (official website). The advantages of researching and browsing e-commerce websites are that they have more experiential tools, such as live-chat customer service support, friendly user navigation tools, specific information on product offer, current promotions, and authentic information. When consumers face issues about a particular product or inquiry, they can chat with the customer service representative to gain prompt reply. Essentially, the product and customer service team eases the purchase decision-making process. Consumers would feel more engaged with the company website as they feel that the e-commerce platform is indeed trustworthy and credible to be shared within their circle of network.

Brand experience appeared to be unfit to function as a mediating variable in this study. Brand experience had no significant relationship with brand engagement, which contradicted to that reported by Nadzri and Musa (2017), Katona (2018). This showed that consumers relied on social media influencers with higher followers and popularity. Marketers tend to hire social media influencers to increase their company revenue (Katona, 2018). Younger generations, such as Gen Z and Generation Alpha, are more exposed to influencers with the most followers. The more the followers, the greater is the impact of a brand on consumers. Hence, consumers highly depend on influencers when compared to brand name. The digital marketing landscape that incorporates social media influencers has higher impact on brand image, in comparison to brand experience.

9 Theoretical and Practical Implications

The framework for this study was adopted and adapted from SOR Theory and brand experience. Since brand experience had no significant effect as a mediator, it did not have an important role in the society. However, social media influencers have the power to increase brand awareness and conversion rate (Keller & Fay, 2016). Most studies have acknowledged the importance of social media influencers to have a greater impact as they are followed by millions of followers. Marketers have begun showering social media influencers with product endorsements so that the latter can create product content and post the content in the social media platform. Besides, consumers' preference has changed as they rely more on the experiences of influential people as their guide in purchase decision-making process.

Apart from theoretical contributions, this study unravels the importance of webrooming towards consumer experience and engagement. This suggests that marketers should focus on the timeliness aspect, while keeping their website content current. Transparency and credibility enhance both user experience and brand engagement among consumers. The quality of e-commerce platform can be enhanced by displaying quality seal badge, friendly user navigation tool, as well as display review quantity and quality. It is crucial to invest in Google Page rank that measures the quality and the quantity of the website content. Marketers can enhance brand engagement for online consumers by developing a mobile friendly user navigation tool as many consumers prefer web-browsing using their smartphones. Eye

catching images, interactive polls, and rich content enable better accessibility with smartphone.

Marketers should also invest in stimulating the senses of consumers to elevate consumer brand experience. The colour of the website layout, interactive videos (GIF or flash videos), and readable font sizes help to evoke the sight senses. Marketers should monitor the information circulating across the social media platform to avoid fake news that might tarnish the brand image of the company. Leveraging quality content and authentic information via social media platform or websites may aid companies to increase their growth and help consumers to feel confident when purchasing online.

10 Limitations and Future Research

Moving forward, future studies should investigate the effect of social influencers and shoppertainment upon brand engagement. The shoppertainment phenomenon draws more consumers as it is fun and addictively engaging with consumers via e-commerce platform or social media. The e-commerce platform, such as Lazada and Shoppee, has invested a lot in their live-streaming channel, thus shaping the future of shopping globally. With the expansion of online shopping, assessing the purchasing behavioural of Generation Alpha and their shopping motivation is imminent. This is relevant as the younger generations embrace social media and digital technology more than the older generations.

Future studies should also evaluate webrooming that inculcates the SOR Theory. It will be interesting to improve the webrooming construct by studying the credibility of online reviews and interactive navigation tools. This can help companies to improve their websites in portraying a reputable image to the consumers. A longitudinal study on this topic would be interesting as it will look into diversified demographic and geographical area to better understand other cultural differences. Finally, future researchers are invited to investigate how fake reviews, fake accounts, and bots influence the online purchasing behaviour among Malaysians.

Appendices

See Tables 1, 2, 3, 4, 5, 6 and Fig. 2.

Table 1 Results from descriptive analysis

Demographic			
	Details	Frequency (n: 276)	Percentage (%)
Age	**18–30 years old**	**206**	**74.6**
	31–40 years old	50	18.1
	41–50 years old	16	5.8
	51–60 years old	4	1.4
Gender	Female	240	87.0
	Male	36	13.0
Marital status	**Single**	**216**	**78.3**
	Married with children	41	14.9
	Married without child	11	4.0
	Single parent with children	6	2.2
	Widowed	2	0.7
Education	SPM	19	6.9
	Diploma	56	20.3
	Bachelor's Degree	**152**	**55.1**
	Postgraduate	44	15.9
	Professional Cert	2	0.7
	STAM	1	0.4
	Foundation	1	0.4
	STPM	1	0.4
Skin care products	Body Lotion or Moisturiser	171	62.2
	Facial Wash or Cleanser	192	70.3
	Daily Sunscreen	137	50.2
	Toner, Serums and skin treatment	**182**	**66.7**
Social media preference	**Instagram**	**194**	**70.3**
	Facebook	72	26.1
	Product website	182	65.9
	Tiktok	88	31.9
	Pinterest	8	2.9
	Search Engine (Google, Yahoo)	168	60.9
	YouTube	128	46.4
	Twitter	18	6.52
	Shopee	6	2.17

(continued)

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Table 1 (continued)

Demographic			
	Details	Frequency (n: 276)	Percentage (%)
	Online Review from reliable sites	3	1.08
	Skincarisma	1	0.4
	Self-care website	1	0.4

Table 2 Convergent validity

Convergent validity					
Construct	Items with codes	Factor loadings	AVE	Cronbach's α	Composite reliability
UGC	A1	0.737	0.577	0.803	0.804
	A2	0.754			
	A3	0.788			
Webrooming	A4	0.688	0.602	0.883	0.881
	A5	0.693			
	A6	0.769			
	A7	0.816			
	A8	0.946			
Brand Expe	A12	0.706	0.552	0.827	0.83
	A13	0.818			
	A14	0.769			
	A15	0.669			
Brand Engage	A9	0.963	0.585	0.805	0.802
	A10	0.689			
	A11	0.693			

Table 3 Discriminant validity

Discriminant validity-Fornell Larker				
	BEngage	BExpe	UGC	Webrooming
BEngage	0.765			
BExpe	0.600	0.743		
UGC	0.531	0.639	0.760	
Webrooming	0.709	0.777	0.615	0.776

Table 4 HTMT criterion

HTMT criterion				
	BEngage	BExpe	UGC	Webrooming
BEngage				
BExpe	0.598			
UGC	0.521	0.642		
Webrooming	0.677	0.78	0.618	

Table 5 Hypotheses testing

Hypothesis testing						
	Relationship	Standard beta	Standard error	t-value	*P* value	Results
H1	UGC → BExpe	0.259	0.078	3.334	0.001	**Accepted**
H2	Webrooming → BExpe	0.619	0.067	9.220	0.000	**Accepted**
H3	BExpe → BEngagement	0.069	0.133	0.522	0.602	Rejected
H4	UGC → BEngagement	0.135	0.094	1.435	0.151	Rejected
H5	Webrooming → BEngage	0.57	0.116	4.906	0.000	**Accepted**

Table 6 Indirect effect testing

Indirect effect					
Relationship	Standard beta	Standard error	t-value	P value	Results
UGC → BExpe → BEngage	0.018	0.039	0.458	0.647	Rejected
Webrooming → BExpe → BEngage	0.043	0.082	0.522	0.602	Rejected

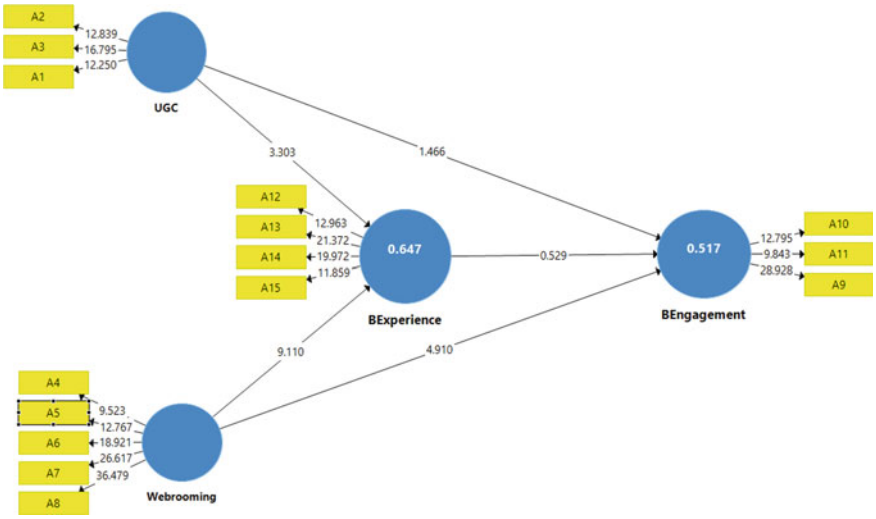

Fig. 2 Bootstrapping results

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Sustaining Competitive Advantage During COVID-19 Pandemic: A Study of Aerospace Manufacturing Industry in Malaysia

Masnita Abdul Ghani, Nurhanan Syafiah Abdul Razak, Putri Rozita Tahir, and Muhammad Alshurideh

Abstract This study is one of the very few studies investigating the aerospace manufacturing industries hit severely by the coronavirus (COVID-19) pandemic, focusing on one of Malaysia's aerospace players. In addition, this study emphasises how an action is engaged to minimise or overcome the impact and effectiveness of strategic moves. PLS-SEM method is used to analyse data gathered from a survey. 30 leadership and executives have been chosen in this survey. Through a comprehensive literature study and survey, this paper presents a guide that illustrates general concepts and processes execution, allowing strategic management personnel to comprehend their market position and identify their long-term objectives. It is an approach to sustained competitive advantages by deliberate internal and external influences towards the change that scribe the marketplace competitive advantage landscape.

Keywords Competitive advantages · Strategic management · Internal influence · External influence · Aerospace manufacturer

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_125

1 Introduction

A company's strategic purpose and a deep understanding of its principal strengths and assets reflect successful strategies. Successful businesses understand their customers' needs and want, their rivals' strengths and weaknesses, and how they can generate value for their stakeholders (Alketbi et al., 2020; Al-Khayyala et al., 2020; Alshamsi et al., 2020). The approach intends to position a company for competitive advantage (Altamony et al., 2012; Kluyver & Pearce, 2015; Obeidat et al., 2021). It results from executive decisions about what to provide, where to participate, and how to win to optimise long-term value (Alshurideh, 2019; Alzoubi et al., 2020; Joghee et al., 2021a).

The set of basic marketing principles that guide businesses in competitive markets defines marketing's role in leading and shaping strategic management (Alshurideh et al., 2020; Hooley et al., 2018; Kurdi et al., 2020). It is creating a marketing plan implemented, including defining where the company will engage and how it will compete.

Aside from the requirement for strategy as a single, interdependent process, the fourth industrial revolution necessitates agility and coordination of internal and external environment changes (Wiraeus & Creelman, 2019). While keeping a strong emphasis on strategy and the client, an agile business can evolve, driving transformation change, and be versatile (Ahmad et al., 2021a; Alaali, et al., 2021; Al-Dmour et al., 2021a; Alshraideh et al., 2017; Altamony et al., 2012; Ben-Abdallah et al., 2021; Shakhour et al., 2021).

1.1 Overview of Selected Company

The selected company CTRM Aero Composited Sdn Bhd is a manufacturer that fabricates composite components, named CTRM AC, along with this article. CTRM AC is a composite component manufacturer specialising in aircraft applications, mainly on nacelle and wing components. The CTRM AC's ultimate goal and commitment are to foster people, capabilities, and markets in Malaysia's advanced composites industry (CTRM AC, 2016).

Due to airline cancellations and reduced global production, this national composite vendor have adjusted their manufacturing rates. CTRM AC supplies wing and engine cover panels to Airbus SE and Boeing Co. As a result, delayed or cancelled aircraft production affects CTRM AC. Boeing announced 60 cancellations of 737 Max orders in June, on top of the previous 47. At the same time, customers cancelled 355 737 Max orders in the first half of 2020. Airbus plans to eliminate 15,000 jobs over two years and reduce production by 40% (Shan, 2020). It is also hard to see the direct impact, like order cancellations. Pandemic COVID-19 had significant effects on the firm revenue generation and forecast (Ahmad et al., 2021b; Akour et al., 2021; Alameeri et al., 2021; Al-Dmour et al., 2021b; Alshurideh et al., 2021; Amarneh

et al., 2021; Leo et al., 2021; Nuseir et al., 2021a; Shah et al., 2021; Taryam et al., 2020). Before the pandemic happened, CTRM AC was forecasted to gain around 919 Million for Financial Year 2020. However, the post-pandemic impact brings down the demand; thus, the adjusted revenue forecasted for Financial Year 2020 will only be around 531.4 Million (CTRM AC, 2020). Overall revenue forecast declined by 42.2%, from 919 Million to 531.4 Million.

1.2 Overview of Covid-19 Lingerie Impact Towards Aerospace Manufacturer

The COVID-19 evidence predicts that the crisis will lead to market restructuring and a significant reduction in interest in air travel. Airflight is vulnerable to oil shortages, force majeure, war, terror acts, global depressions, and outbreaks. In addition, demand severely weakened due to lower disposable income and behavioural changes (Suau-sanchez et al., 2020). Previous outbreaks apex around one to three months and back to the earlier situation in the next seven months. There are two possible outcomes expected from this situation. In 2020, the 'Limited Spread' scenario predicted a $63 billion loss in passenger revenues (11%), while the 'Extensive Spread' scenario predicted a $113 billion loss in passenger revenues worldwide (19%) (Pearce, 2020). In addition, stock markets are now expecting a substantial drop in airline profits internationally, far beyond the influence of SARS (Fig. 1).

The International Civil Aviation Organisation (ICAO) reported a 60% reduction in airline passengers (both regional and international) in 2020 compared to 2019, with a total decrease of 1,376 million passengers, or 74%. Loss of $250 billion in

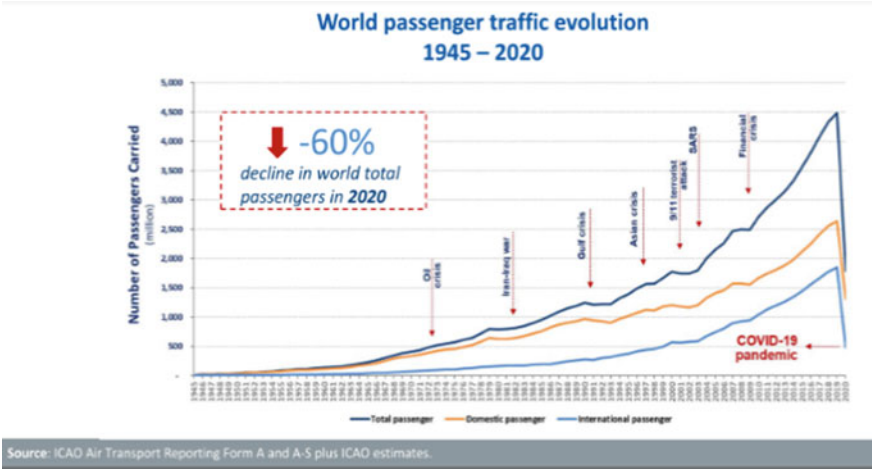

Fig. 1 World passenger traffic (*Source* ICAO)

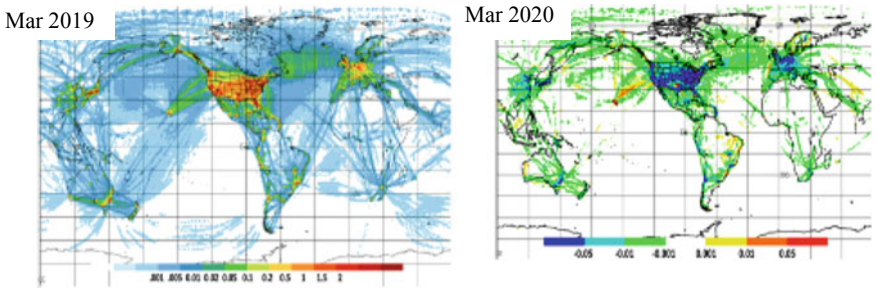

Fig. 2 March 2019 versus 2020 on Global ABO coverage observation (*Source* James et al., 2020)

gross operating income for airlines due to lower passenger numbers (Air Transport Bureau, 2020). According to the Airports Council International (ACI), 40% of traffic passengers and 50% of the terminal income by 2020 could wipe out due to COVID-19 (Airports Council International, 2020).

The plane observation range is densest over Europe and, Northern America subsequently followed by East Asia and Australia (James et al., 2020). 665 airports had at minimum one daily climb, 400 from European or Northern American terminals in late November 2019. However, flight cancellations due to the pandemic reduced aircraft observations by 80% by late April 2020.

Global COVID-19 flight reductions are shown in Fig. 2. Information coverage amid March 2019 and 2020 resulted in reduced air traffic worldwide. However, several flight routes and terminals have had coverage increased (James et al., 2020). The most affected industry is related to the airline industry (Haydon & Kumar, 2020). Commercial traffic fell 42.4% in October 2020, and traffic was 43% below 2019 levels in September and August, an insignificant gain (−45.2%). In contrast, traffic fell 1.67% from September to October this year. Commercial traffic was depressed 73.7% in April (Petchenik, 2020).

Far ahead, reducing air transport demand and impact on the aircraft manufacturer. Following the COVID-19 crisis, Boeing lifted the lid for the very first time in the early twentieth century, revealing a substantial decrease for the coming decade. In 2020–2029, it anticipated 18,350 deliveries, declining 10.7% from an informal prediction of 20,550 (Johnson & Hepher, 2020). According to the 2020 BMO (Boeing Market Outlook), revenue for 18,350 passenger airliners will be 11% lesser in the next decade than the corresponding 2019 prediction of $US2.9 trillion (Ratings, 2020). As a result, Boeing will decrease its 2020 passenger aircraft sales volumes, as reported by S&P Global Market Intelligence. In addition, major airlines postpone new jet orders and delivery dates corresponding to reducing passengers spurred by the COVID-19 pandemic. According to a statement, Boeing said it might reduce aircraft production rates for 787 models to 10 units from 14 units per month in 2020, with an additional reduction to 7 units per month by 2022 (Lazzaro, 2020). In the first quarter, the 787 models accounted for 58% of Boeing's overall demand.

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Based on (Oestergaard, 2020), Airbus has slashed output on several programs and aims to keep the primary plane yield at 40% below levels before the pandemic for the next two years. Boeing reduced the production capacity of 787 jet models from 14 to 10 per month in 2020 and a further drop to 7 aircraft in 2022 (Lazzaro, 2020). As a result of the COVID-19, another aircraft OEM, Airbus, will reduce output across its entire manufacturing line. According to Garcia (2020), Airbus is cutting main aircraft models by a third to combat the COVID-19. 40 A320s will be built per month, down from 6. A330s will be produced at a rate of two per month instead of six. Likewise, A350 production will drop to six per month from ten aircraft sets.

COVID-19 spread has substantial waves on global production and supply chain networks. Manufacturing facilities have closed or reduced capacity, and the raw and finished product supply chains are disrupted by trading and transportation issues. This pandemic has a major influence on reintegrating industrial workers. It reduced human resources, lowering manufacturing process efficiency. Proper safety measures are required to consider social distance in the workplace and implement frequent health monitoring for employees to enhance the human aspect of production. Supply chain disruptions included (a) decreased demand for goods (automobiles, public transportation, and textiles), (b) decreased demand for services (temperature scanners, ventilation systems, face masks, disinfectants, protective clothing, and essential food products), and (c) distribution failures and unpredictability in raw materials, (d) Reducing the ability to deliver and obtain goods on time inadequate supply and transportation constraints; and (e) Assure employees capability to construct and transport goods (Kumar et al., 2020). The pandemic virus affects all industries, particularly aviation, passenger and cargo airlines, airline food caterers, airport authorities, aircraft parts manufacturers, travel agents, and MROs (Rahman et al., 2020). The virus's spread has varying effects on the aviation industry. The virus reduced airline capacity by nearly 50%. It is happening in nearly every country.

Despite the background and list of critical factors that could influence aerospace manufacturer demand reduction, it also represents a general insight into national aerospace composite manufacturers currently struggling due to demand reduction from the COVID-19 outbreak impacts. The delivery demand is pushed out to the right and with an increase of concern on ordering cancellation due to airline bankruptcy (AlShurideh et al., 2019; Hamadneh et al., 2021; Joghee et al., 2021b; Lazzaro, 2020; Oestergaard, 2020). This outbreak badly affects aircraft manufacturer's revenue and faces high inventory levels. Nevertheless, the manufacturer obliges to manage in-transit material, ordering material with a long lead-time, and several government commendations and requirements that affect different global manufacturing production flow to remain resilient in market share.

1.2.1 Impact of COVID-19 on the Aviation Players

Rahman et al. (2020) investigated the impact of COVID-19 on aviation such as airlines, airport authorities, air cargo providers, in-flight food caterers, aircraft manufacturers, maintenance, repair, and overhaul organisation. Their study recommended

empirical research on COVID-19 and its impact on the aviation business. Due to COVID-19, research can focus on business improvement initiatives and current strategies to improve the performance of aviation organisations. Each aeronautical business can explore micro, macro, and meso factors to define key measurements. They also recommend future research on the relationship between foreign and local regulators to identify the best business practices for aviation players.

While (Thorbecke, 2020) used sectoral stock price responses to study the COVID-19 crisis' impact on the US economy, affected industries include funerals and airlines. Massive areas of the economy whose recovery is dependent on pandemic control rather than macroeconomic conditions. It will be interesting to see how other countries' stocks have responded and how industrial structures, development levels, and macroeconomic policy responses differ across countries.

(Mhalla, 2020) examined the COVID-19 consequences on the worldwide economy, focusing on oil and air travel. The long-term effects of the coronavirus are still unknown, but demand is expected to remain weak as the epidemic spreads to other major regional economies. In addition, due to the new coronavirus epidemic, many European airlines are reducing flight schedules and cutting costs. As a result, the major airlines will have to decide whether to ground planes or redeploy them.

An airline, airport, aircraft manufacturer, and other industry-specific issues are discussed in the Liptakova article. (Liptakova et al., 2020) believed that recovering from the current aviation crisis will require economic recovery and regaining public confidence. Nobody knows how long this will go on. Travel volumes will not resume for 3 to 5 years, according to IATA. However, the present predicament may purge the manufacturing in multiple approaches, such as eliminating weak airlines, as recent airline bankruptcies have shown.

1.2.2 Responsive Towards Firm Resilient

Xu et al. (2020) investigate the global supply chain's efficiency and reaction and propose a set of managerial strategies to reduce threats and improve agility in different manufacturing segments. An article discusses the implications of COVID-19's lengthier period, marketplace, and scope. The COVID-19 pandemic has reportedly disrupted major global supply chains in pharmaceuticals, food, electronics, and the automotive industries. Temporary closures of industries and shops, travel restrictions, and compulsory quarantine of citizens were used to stop the spread of COVID-19. Shortages of human resources, active ingredients, and raw materials resulted. Tightening controls exacerbated the issue. Delays and inventory shortages result in global supply chains, making two long-term competitiveness enablers recommendations. Understanding critical vulnerabilities and monitoring disruptive risks in real-time is the first. The subsequent endorsement collaborates with internal stakeholders and strategic and critical suppliers to develop risk management strategies (Ahmad et al., 2021c; Alshurideh, 2017; Alshurideh et al., 2019).

Aviation is currently focused on short endurance. An expectation of this "new normal" in this way must happen now, to take into account change over the next six

to two years. The aerospace industry is seeing widespread requests for crisis state assistance and, more importantly, legislative intervention. Deregulation in aviation must be adequately managed to avoid twisted rivalry (Singh, 2020).

According to Hader (2020), firms and governments must thoroughly ensure the critical industrial skills are occupied to avoid driving the entire sector at risk. As a result, the industry must quickly agree on the "new normal" manufacturing rates, develop a mutual strategy for transforming the sector to the "new normal", recognise and support vulnerable components in the transition process.

Various industries have evolved immensely. The need to propagate massive R&D investments across many markets drove the globalisation of the aircraft manufacturing industry. Monitoring globalisation is an essential strategic management undertaking. Even more important is knowing how to use that data to gain an advantage (David et al., 2017). The ability to gain and hold a competitive advantage is critical to long-term success. A company's competitive advantage typically lasts only a short time due to competitor copying and weakening.

Typically, COVID-19 focused on the perspective of tourism, medical science, and airlines services as mentioned by Suau-sanchez et al. (2020); Rahman et al., 2020; Mhalla, 2020; Sun et al., 2020; Iacus et al., 2020; Madi Odeh et al., 2021). In contrast, a clear industrial organisation perspective of COVID-19 is inattentive. Only some researchers, which is (Singh, 2020), emphasised COVID-19 impact on aerospace, which conducts investigations to determine various methodologies embraced to determine the market impact and showcase the aerospace industry's development rate and downturn patterns because of the COVID-19 pandemic. So far, limited study has worked on the implementation to overcome the lingering COVID-19 effects, specifically on aerospace manufacturers in Malaysia and how the related firm reacts to sustain its competitive advantages and remain resilient.

2 Literature Review

2.1 Competitive Advantages

Corporate competition is inevitable. To compete, one must constantly distinguish, understand the market, consumer needs, and their variations. It is essential to consider and control a wide range of resources (Kuncoro & Suriani, 2018). Competitive advantages occur when companies outperform rivals economically (Allozi et al., 2021; Kabrilyants et al., 2021; Shamout et al., 2021). Financial value is the difference between a consumer's perceived benefits and the total cost of the goods or services (Al-Jarrah et al., 2012; Assad & Alshurideh, 2020a, 2020b; Barney & Hesterly, 2018; Shah et al., 2020). The study of heterogeneous firm features necessitated various methods to identify, measure, and comprehend firm resources and capabilities. In the resource-based approach, supporters argue that each firm has unique resources and skills to maintain competitive advantages (Dagnino & Cinici, 2016). Each theory

relies on observations and predictions about how competition in this industry will evolve to gain a competitive advantage. The more accurately these theories and statements reflect current competitiveness in this sector, the more likely it will achieve a strategic edge by applying its strategies. If these conclusions and theories are incorrect, a firm's tactics are unlikely to provide a competitive advantage. Difficulty in predicting market competition, determining a company's strategy is challenging.

The five reasons that propel strong growth companies are human capital, human resource management, strategy, skills, and creativity (Al Kurdi et al., 2021; Demir et al., 2017; Harahsheh et al., 2021; Nuseir et al., 2021b). Competitiveness measure by past success or future competitiveness. Examples are financial performance (profit, earnings growth, returns on investment), non-financial performance (customer retention, employee growth), benchmarking balanced scorecard, metrics like earnings, pricing, productivity, and market share were used (Sachitra, 2016). A competitive advantage allows a company to outperform its competitors. Thus, profitability is a key indicator for assessing competition, and turnover is a key profit margin. However, efficiency, market share, and profitability are insufficient to determine firm-level competitive advantage.

Competitive advantage is assessed by comparing the results of strategic attempts to firm profitability or market share stabilisation. Although competition appears to revert corporate performance to the mean, long-term competitive advantages ensure great returns (Maury, 2016). A company's financial stability allows it to make prudent financial decisions and maintain or reduce market competition. According to Kliestik et al. (2020), interim financial stability reduces future financial threats. A company's overall financial strength is determined by the ratios listed above and other factors such as its size, industry, and location. Profits and losses are the most critical indicators of a firm's performance, especially compared to other manufacturing representatives. The results show that the liquidity ratios that measure a firm's ability to repay short-term debt obligations are crucial. The current ratio measures a company's ability to pay short-term obligations using current assets. A higher current ratio is better than a lower current ratio because it shows the firm pays a current debt. In the following period, short-term liabilities are outstanding. The liabilities-to-total-assets ratio measures the number of assets hidden by liabilities. The ratio of liabilities to total assets is high, indicating low stockholder equity and potential creditworthiness issues. Liabilities-to-total-assets ratios are high in distressed firms. Then there are the total sales to total assets ratio, which measures corporate efficiency by comparing assets to revenue. The higher the ratio, the healthier the firm. Finally, the equity-to-asset ratio regulates a firm's financial leverage. A higher equity-to-asset ratio is required to convince creditors that a firm is sustainable and low-risk.

Long-term success requires gaining and maintaining a competitive advantage. A company's competitive advantage typically lasts only a short time due to competitor copying and weakening. So gaining a competitive advantage is not enough. Assemble, implement, and evaluate plans that capitalise on external and internal variables to achieve long-term competitive advantage. Different industries go global for various reasons. The need to propagate R&D investments across many markets drove the globalisation of the aircraft manufacturing industry (David et al.,

2017). Monitoring industry globalisation is a strategic management task. Even more crucial knows how to use that data to acquire or optimise advantages.

A wide range of methods for assessing an enterprise's competitiveness and market position are being investigated, such as PEST analysis, McKinsey, Model Boston Consultative Group, GAP analysis, Michael Porter, situational analysis (SWOT analysis), expert assessment method, financial and economic method, and others (Khanenko, 2019).

Companies that can maintain a competitive advantage provide sustained benefits. They help a company's reputation by associating it with a long-lasting, appealing offer. A company can create a competitive advantage by combining a temporary competitive advantage (TCA) and a sustainable competitive advantage (SCA). This benefit adapts to changes in the company's background. Another management implication is that combining SCA and TCA does not guarantee a competitive advantage. By combining its strengths, the company can seize new opportunities while maintaining its core business. This method necessitates the establishment of fundamental assumptions (Sołoducho-Pelc & Sulich, 2020). Following these principles increases the likelihood of achieving outstanding short- and long-term results. Having an SCA and TCA focused not only on economic values but also on social and environmental issues may be reasonable.

Nobody has unlimited resources, and they must assess the company's value of various options. An organisation's long-term strategy decisions bind it to specific goods and markets. To win in the long run, strategists can help decision-makers predict significant events that could impact the company. To make assumptions, one needs to know what is coming up in the company's business. Strategists must adjust if actual events differ significantly from forecasts. No policy can be made without rational expectations. Accurate assumptions are a competitive advantage for well-informed firms (David et al., 2017). Only after competitors attempted to copy a firm's strategy have stalled or failed can a firm claim one or more critical strategic benefits. Also, no competitive advantage is permanent. How a competitor's responsiveness to obtain the abilities to imitate a company's value-creating strategy defines the duration a competitive advantage can last (Hitt et al., 2017).

According to Barney and Hesterly (2018), the best way for a firm to choose its strategy is to follow strategic management principles. The strategic management framework is a set of evaluations and decisions that will help the firm find a competitive advantage. The strategic management method of a series collection of analyses and choices will improve the probability of a company selecting a successful approach that produces competitive advantages, as shown in Fig. 3 below.

(Gurel & Tat, 2017) and (Zu'bi et al., 2012) suggested that the external and internal forces' assessment is one core element in strategic management. An external review should help the company identify key competitive risks and opportunities. It also points out that the world of competition is changing, posing new challenges and opportunities for businesses. An internal review identifies a company's strengths and weaknesses. It also shows a company's strengths and resources as sources of competitive advantage rather than gains.

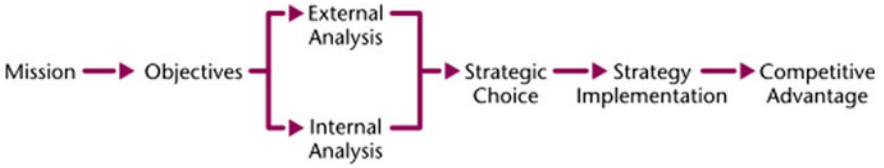

Fig. 3 Strategic management process (*Source* Hesterly & Barney, 2008)

2.2 Scanning Internal and External Influence

Many firms' success or failure is determined by the factors that influence their operations. Scanning the internal and external environments is critical for business planning and organisational analysis (Amuna et al., 2017). It is vital to both for-profit and charitable companies' business practices. However, it is challenging to plan excellent strategy management without considering environmental influences.

According to Rahman et al. (2020), to remain competitive, the company should carefully evaluate its external and internal factors. The approach is linking a company to its environment, both internal and external. These findings were reflected in the SWOT analysis (Guerras-Martín et al., 2014). Complex political, social, economic, technological, and cultural changes are now the norm. In a complex environment, an entity that is not responsive cannot survive. An environmental scan is a method of analysing the climate that is dependent on several variables. External factors include political, economic, scientific, technological factors. The internal environment includes resources, capability, culture, management style, and structure. This study's Independent variable is a latent variable, environment factor that influences business landscape. A competitive market will derive from PEST (Political, Economic, Social, and Technology) and SWOT analysis to assess CTRM AC key external and internal factors (Fig. 4).

2.2.1 Relationship Between Internal Influence and Competitive Advantages

Internal analysis is a third aspect of the strategic planning process that describes the successes besides limitations. Recognising the magnitude and nature of a business's tools and expertise and structure, particular talents, and company-specific or distinctive capabilities are addressed when investigating the origins of successful adviewing (Petchenik, 2020). Build and maintain a competitive advantage entails a business attaining superior performance, consistency, creativity, and responsiveness for its consumers. The company's strength contributes to outstanding performance, while its limitations interpret as unsatisfactory performance. The internal analysis supports a firm in identifying its strengths and weaknesses (Haydon & Kumar, 2020). It also assistances in understanding that its resources and capabilities are likely to be competitively advantageous and less likely to be the source of such advantages.

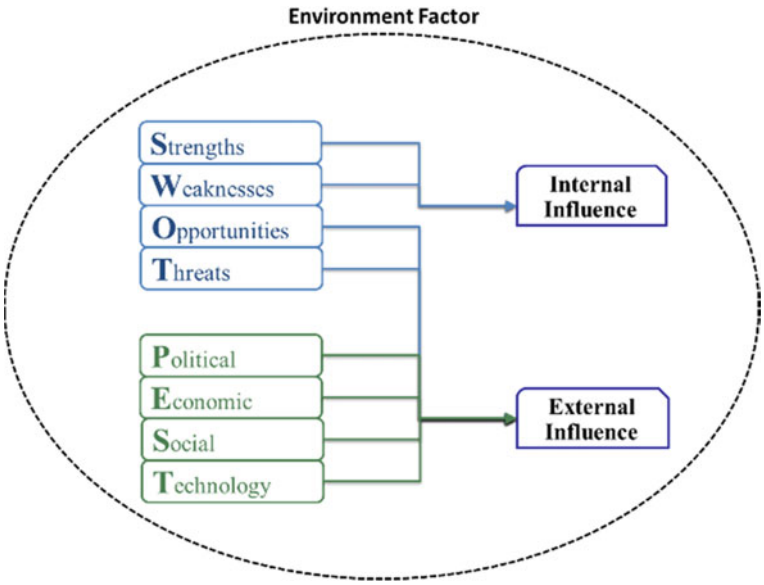

Fig. 4 Correlation between SWOT and PEST towards internal and external influence

H_1: Internal factors possess a direct positive influence on competitive advantages

2.2.2 Relationship Between External Influence and Competitive Advantages

External analysis is a second aspect of the strategic management phase in studying the firms' exterior operational climate. External evaluation's primary goal is to recognise strategic prospects and risks in the firms' operating atmosphere that could influence how it pursues its task. The firm recognises critical threats and opportunities in its competitive environment by conducting an external analysis (Haydon & Kumar, 2020). It scrutinises how the rivalry is likely to develop in this environment and its consequences for a firm's threats and opportunities.

H_2: External factors possess a direct positive influence on competitive advantages

2.2.3 Relationship Between Strategic Management and Competitive Advantages

The strategic management method is a sequential collection of analyses and choices which improve the probability of a company selecting a successful approach to produces competitive advantages (Barney & Hesterly, 2018). The approaches define

a company's productivity in meeting customer needs, and executives are heavily responsible. High-level skills are required to protect and grow future corporate strengths. Top management is in charge of allocating staff and financial resources. These findings often determine the fate of entire industries and businesses. Strategic Management enables companies to add value, build, discover, improve, and conquer their competitive position by demonstrating the necessary actions. Organisations can use strategies to determine future addresses or treatment plans, actions to be taken, timetables, and internal leadership to position themselves for growth (Ratings, 2020). They define how efficiently a company meets customer needs, and executives are heavily liable. High-level skills are required to ensure long-term corporate strength preservation and expansion. Management makes essential decisions about staffing and budgeting. Strategic Management enables businesses to add value, build, discover, improve, and conquer their competitive position by demonstrating the necessary actions (Lazzaro, 2020).

H_3: Strategic Management possesses a direct positive influence on competitive advantages

2.2.4 Relationship Between Environment Factor, Strategic Management and Competitive Advantages

According to Oestergaard (2020), strategic management is a cognitive science that intersects with sociology, economics, psychology, finance, and marketing. The current state of the field can present a complex picture of numerous approaches and paradigms. As a result, there is no conclusive general theory that encompasses strategic management. In strategic management, decisions are made. Strategic decisions are those that determine a company's strategic direction. Their mission is to ensure the company's long-term success, which includes: (a) recognising and understanding path dependencies, (b) responding to current change dynamics, and (c) implementing strategic programs on the previous two points' foundations. Each resolution's action will define future growth. It includes (a) external and internal climate appraisal, (b) strategy formulation (focus on the long-term planning), and (c) strategy implementation (Strategic management focuses on managing and accessing potential threats and opportunities while taking into account a company's strengths and weaknesses). Companies must constantly update their organisation and search for new strategic goals and execution approaches to keep up with the changing climate (Garcia, 2020). The global market's ability to sustain competitive resources may be another competitive factor. Global affiliates or strategic alliances should learn these techniques. Concepts and ideas, especially international coalition methodologies, continue to shape market competition.

H_4: Strategic Management mediates the relationship between environmental factors and competitive advantages

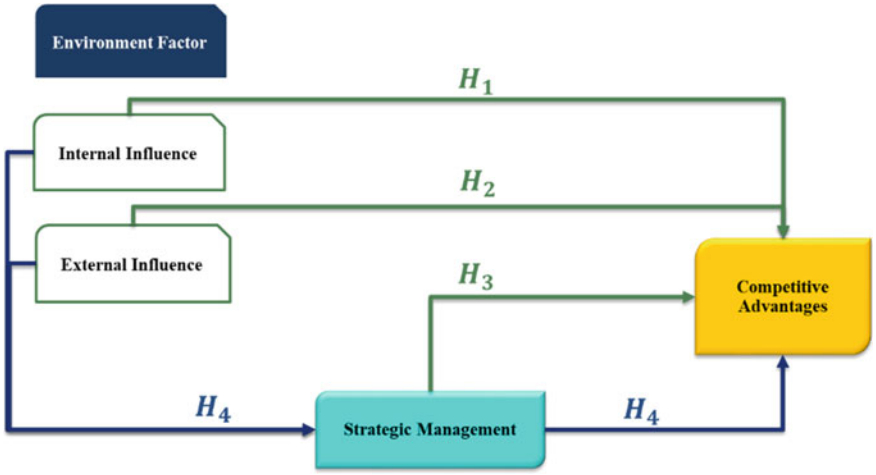

Fig. 5 Research framework

2.3 Research Framework

See Fig. 5.

3 Methodology

3.1 Research Method

The study utilises a quantitative approach by using the survey and literature method to discuss the research topic to determine the mediation effect of strategic management on the relationship between environmental influence and competitive advantages.

(a) Survey:

The questionnaires were adapted and modified from the previous study by Borges and Gaia (2010); Sigalas et al., 2013; Bismark et al., 2018). Five Likert-point scales use to measure and evaluate response. The environment influences are the exogenous latent variable, while competitive advantages represent the endogenous latent variable and strategic management is the mediating latent variable in this study. The survey will be distributed online amongst 30 personnel directly involved with strategic management activities.

(b) Literature:

Comprehend articles (from media and relevant websites) and company reports, archives, and presentations.

3.2 Data Analysis Method

Data collection emphasis the competitive environment factors inquiry will be collected. The PLS-SEM is then used to investigate the causal relationship between the variables and the mediator. SmartPLS statistical software employs hypothesis testing to investigate the causal and effect relationship between independent and dependent variables in theory. (Astrachan et al., 2014; Hair et al., 2019; Hanafi & Fadilah, 2017). PLS-SEM outperforms traditional SPSS; flexible sample does not require normality assumptions and provides solutions with small sample sizes due to a small population. (Avkiran & Ringle, 2018; Fornell & Bookstein, 1982; Hair et al., 2017, 2019; Hanafi & Fadilah, 2017).

4 Conclusion

The study's scope focuses on the environment's influence and lingering effects of the uncertainties from the COVID-19 pandemic to market share, disregarding other associate factors such as bailout, policy changes, and government austerity drive.

This study is one of the few that focuses on the aerospace manufacturing industries that have been significantly impacted by the coronavirus (COVID-19) outbreak by focusing on one of Malaysia's aerospace players. Furthermore, this research reflects how action could reduce or eliminate the impact and effectiveness of the strategic decision.

Competitiveness has evolved into the economic criterion for orienting and evaluating the company's performance from the inside out. The organisation must understand and determine which approaches are most likely to provide a competitive advantage over its rivals based on internal and external influences. Through a comprehensive literature study, this paper presents a guide that illustrates how general concepts and processes can be done, allowing strategic management personnel to understand their market position and, from there, identify where they hunger to reach in the future. Strategic Management enables businesses to provide value, build, discover, strengthen, and maintain competitive advantages by specifying what measures to achieve this position. It enables firms to stand out the addresses or course of action in the future, identifying the action rules, tracking behaviour in time, and outlining the company's internal leadership to set the organisation in the best competitive environment to achieve success. Business success necessitates a company's constant adaptation to its surroundings. Although it is not a guarantee of success, it enables organisations to make long-term decisions, put them into practice effectively, and initiate corrective steps as appropriate. Integration of intuition and analysis is essential for realistic strategic judgement.

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Barriers to Reverse Logistic on Implementation of Reverse Logistic: A Case of Malaysian Small and Medium Enterprise

Mohamad Arif Izuddin Rahmat, Nurhanan Syafiah Abdul Razak, Suriati Deraman, and Muhammad Alshurideh

Abstract Globally, reverse logistics is gaining traction due to increased awareness and as a result of resource depletion and climate deterioration. Firms have obstacles implementing reverse logistics from a variety of stakeholders, both internal and external. This study covers a quantitative research method. The target respondents of this study are small and medium enterprises facing barriers to reverse logistic implementation. In this research, the number of respondents is 113 out of a sample size of 81. The collection method is carried out through an email questionnaire. Considering the nature of the study, SPSS version 23 is used to analyse the quantitative data. As a reminder to researchers, future research initiatives may expand this model to include different types of businesses and industries, as well as a broader demographic, which will have an effect on reverse logistics implementation.

Keywords Reverse logistic · Green supply chain · Barriers · Sustainability · Green operation management · Waste management

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_126

1 Introduction

The rapid population growth worldwide and the booming technological progress have increased the manufacture and consumption of short-lived goods. As a result, more raw materials have been consumed by rapid production, thus contributing to the growth and sustainment of sites. Therefore, companies in their supply chain management need to integrate strategies that deal effectively and efficiently with sustainability issues.

A lack of top-level management interest, insufficient time commitment, shifting priorities within and across companies, and an inability to establish a corporate supply chain planning target for reverse logistics are among the reasons firms believe reverse logistics is undervalued in supply chain management general (AlShurideh et al., 2019; Hamadneh et al., 2021; Joghee et al., 2021; Vieira et al., 2020).

In practice, it has been demonstrated that the most effective reverse logistics operations result in increased sales income and decreased operational costs (Pacheco et al., 2018). Additionally, researchers have identified several potential benefits of reverse logistics, including improved resource utilisation and environmental preservation (Abbas, 2018). That is why this paper aims to investigate the most dominant factor of barriers in the implementation of reverse logistics within the small and medium enterprises in Pahang, Malaysia.

1.1 Background of the Study

This study presents an empirical analysis of the obstacles to reverse logistics by small and medium enterprises. These barriers are the main obstacle in the way the barriers function. The Reverse Logistics implementation has various obstacles. The Four barriers and twenty-nine sub-barriers are essential for implementing Reverse Logistics by small and medium enterprises.

According to Waqas et al. (2018), Kaviani et al., (2020a), the Four general categories of main barriers that block businesses from following reverse logistical practice are financial, knowledge, law and regulation, and management. Some of the barriers used by companies to enforce reverse logistics have been clarified. According to these companies, reverse logistics activities were implemented either to gain the economic advantages included in the competitive advantage or compelled by government law and public environmental knowledge. These four variables, 'traditional economic theory,' are necessary to understand, and their sole goal is to produce as much income as possible so that their shareholders are pleased (Rubio et al., 2019).

1.2 Research Discussion and Research Gap

This study presents an empirical analysis of the obstacles to reverse logistics by small and medium enterprises. These barriers are the main obstacle in the way the barriers function. The Reverse Logistics implementation has various obstacles. There are four barriers and twenty-nine sub-barriers necessary for implementing the Reverse Logistics by small and medium enterprise that has been compiled from multiple studies in the past.

The study outlines barriers to reverse logistics adoption in the world's leading sector. The purpose of this study is to look at the variables that prohibit businesses from adopting reverse logistics and to identify the primary hurdles that affect these businesses. According to Ritzén and Sandström (2017), the three general categories of main barriers that block businesses to follow reverse logistical practice are economic, legal and corporate citizenship. Some of the barriers used by companies to enforce reverse logistics have been clarified. According to these companies, reverse logistics activities were implemented either to gain the economic advantages included in the competitive advantage or compelled by government law and public environmental knowledge. These three variables, 'traditional economic theory,' are necessary to understand, and their sole goal is to produce as much income as possible so that their shareholders are pleased (Frei et al., 2016; Ritzén & Sandström, 2017; Yin, 2017). Even the company's role in the management of social responsibility diverges from its main aim to make money.

Prior research has examined the constraints to reverse logistics solely to ascertain its sustainability (Vieira et al., 2020). However, as environmental awareness rises, corporations face significant pressure from stakeholders, including government and customers, to mitigate their negative ecological consequences (Yin, 2017). Indeed, the private sector must consider integrating market practices with sustainability and manufacturing to maintain competitiveness (Frei et al., 2016; Ritzén & Sandström, 2017). In addition, global warming, climate change, trash, and air pollution have increased in recent decades, prompting specialists worldwide to be more ecologically friendly and seek the most acceptable feasible solution (Škapa, 2011).

In addition, several studies (Badenhorst, 2016; Kaviani et al., 2020b; Meyer et al., 2017; Sari et al., 2018; Škapa, 2011) have demonstrated the importance of reverse procedures in improving the performance of a firm's supply chain. Small and medium enterprises in Pahang, Malaysia, focused on this study paper's analysis of reverse logistics practices. A small and medium enterprise is a very unexplored and complex topic because of the requirements enterprises must meet. Using proven quantitative methods, the study has attempted to analyse reverse logistics activities in small and medium-sized enterprises towards the implementation.

2 Literature Review

2.1 Reverse Logistics

Reverse logistics consists of practices including material recycling, reuse, reduction, and replacement (Badenhorst, 2016). Furthermore, according to Sari et al. (2018), In light of all the new laws and regulations that have emerged in recent years, a method called reverse logistics has been making its mark among numerous industries. This approach helps these organisations achieve their profitability and growth share strategic goals by reducing their potential impacts and increasing their environmental sustainability. Therefore, knowledge and learning management practices are vital to the concept of informational boundaries for an organisation (Yin, 2017).

Besides that, most top-performing businesses understand the competitive advantage comes from effective distribution and supply chain operations. According to Meyer et al. (2017), the display of an efficient supply chain comes from an information system that predetermines the customer's satisfaction without obstacles during the initial process. According to Waqas et al. (2018), During transport, reusable containers can minimise waste products and product damage, helping to reduce ergonomic and safety issues further. The product development process will aid the 3R Recycling, Reuse, and Restoration principle. To minimise unnecessary packaging, 3R should be considered in product design.

2.2 Reverse Logistics Barriers

Over the past decade, environmental problems have increased, to ecological issues have been noted. They also thought that reverse logistics could contribute to industrial growth in conjunction with supply chain management (Chileshe et al., 2015). Therefore, green supply chains need to sustain global market competitiveness (Meyer et al., 2017).

Greening the supply chain can be inhibited by numerous police and government sectors around the world. Several environmental problems in India are driven by the rapidly increasing population and economic growth because of the growing and massive intensification of farming, the unregulated development of urbanisation, industrialisation, and forest destruction (Ravi & Shankar, 2015). (Kirchherr, et al., 2017) Have identified vital barriers encountered in reverse logistics: higher costs, poorly trusted policies, lack of knowledge, resources and supplier expertise, and lack of policy by the government.

According to Aryal (2020), literature reviews show that many researchers found barriers to effective implementation of reverse logistics systems that need to be established and explored. A comprehensive analysis has been done to identify the barriers that are currently impeding a total return to logistics system implementation and determine the fundamental barriers that lack management understanding and

support. They underlined the fiscal, technical, and management systems constraints that prevent the effective implementation of sustainable processes.

2.3 Relationship Between Financial Related Barriers and Reverse Logistics Implementation

First of all, (Younas & Bajwa, 2019) analysed the 26 obstacles to reverse logistics theories implementation. Barriers are described as one of the most impacting walls, namely high investment and lower return on investment.

Direct and transaction costs include environmental management costs (Sari et al., 2018). These two prices serve as an essential barrier to sustainable practice implementation. Adoption of state-of-the-art technology, construction of IT infrastructure, and recruitment of highly skilled workers all go toward providing knowledge and training to sustainability workers. The key barriers are high investment start-ups, slow return on investment, and low-profit margins (Shao et al., 2019).

There are no consultants, green architects, green developers, contractors, and specialists among the corporate departments. Thus, this is the "lack of consultants, green architects, green developers, contractors, and specialists". A high-quality implementation offers new concepts for the organisation's overall growth, learns innovative technologies, and efficiently communicates knowledge, making it easier to incorporate sustainable practices. However, attracting high-quality staff is a barrier to financial restrictions. It also lacks IT infrastructure networks, a lack of waste management technology, reuse, and recycling. On the other hand, the utilisation of IT infrastructure decreases the substantial use of paper and time consumption (Shohan et al., 2020).

If the implementation of sustainable practices fails, the organisation will be deemed worthless. In addition, the brand value and competitiveness of the business may be affected (Singh et al., 2016). The goal of reverse logistics practices is to strengthen their environmental and financial efficiency, IR, eco-design, or ecological practices design. The emphasis on business organisation's sustainability is that today the company's environment is being transformed (Sivakumar et al., 2018).

Heavy investment is needed in reverse logistics programs concerning infrastructure, technology, and necessary software that is a significant impediment in small and medium enterprises to reverse logistics programs (Škapa, 2011). For example, it is estimated that relocating a product from consumer to the manufacturer was nine times the cost of relocating a product from supplier to customer. Financial constraints thus serve as a significant obstacle to reverse logistics.

According to Starostka-Patyk et al. (2014), several technological changes that demand high investment may be needed to introduce the reverse logistics industry successfully. However, investors should note the returns and the recovery of the investment. It has been a considerable challenge for technology to introduce new technologies and save investment costs professionally. Often because of economic

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constraints, the implementation of reverse logistics was met with obstacles. For example, one of the biggest problems in the chemical industry is toxic goods. Therefore, the introduction of reverse logistics becomes troublesome because the cost increases and the reverse knowledge is missing.

Successful reverse logistics requires staff training (Tesfaye & Kitaw, 2020). However, this training calls for financial resources, which can or may not be available for the organisation. This makes it very difficult for the company to handle reverse logistical activities. Therefore, training and education are the key demands for an organisation's success; the more significant the reverse logistics operation's productivity, the more skilled personnel available.

H1: There is a significant relationship between financial related barriers towards the implementation of reverse logistics.

2.4 Relationship Between Knowledge Related Barriers and Reverse Logistics Implementation

Apart from the financial factors, personnel and instruments are critical for executing related reverse logistics activities. Often essential are knowledge-based tools such as expertise and related knowledge relating to management capabilities and technology (Sivakumar et al., 2018). Therefore, the appropriate reverse logistics capital commitment will improve the logistics competence of an organisation.

Not only that, according to Bianchini et al. (2019), an organisation must need to have Data, method, commodity, or organisational support technologies deemed essential to the management of a green supply chain. Proper preparation and efficient human capital development are critical parts of the green supply chain. Small and medium enterprises encountered difficulties achieving adequate efficiency in their initiatives because of a shortage of human capital and internal innovation (Ormazabal et al., 2018). They also noted that many small and medium enterprises face new criteria, mainly because they lack information, skills, and financial and human capital.

Next, (Reddy & Audo, 2016) The absence of expertise in reverse logistics is a hindrance to proper implementation. In addition, the results demonstrate that reverse logistics is connected to knowledge and experience. In addition, it finds that reverse logistics has an enormous impact on a firm. Thus companies should also have a more robust understanding of reverse logistics' value.

(Moktadir et al., 2020) also suggest that reverse logistics awareness can carry economic advantages by taking back the commodity returned to use. Many of those who know the benefits of reverse logistics and what potentials or goods can be used in their companies are therefore essential to analyse the degree of awareness and perception. Besides that, according to Rubio et al. (2019), in the execution of related reverse logistics activities, workforce and capital are essential in addition to financial considerations. As a result, the hiring process must include knowledge-based instruments, such as talents and critical skills that are applicable to operating

resources and technology. Improving a company's logistics expertise will necessitate an appropriate role for staff involved in reverse logistics.

Also, (Sharma et al., 2011) suggest that consumers are unaware of eco-friendly goods and their advantages. The most basic form of external pressure for any company is customer requirements. When a customer requests an eco-friendly product, the company must modify or update the current infrastructure to meet the same criteria. Sustainable practices are tough to follow for companies because of the increasing operational costs. According to Nikmehr et al. (2017), the lack of client awareness contributes to the low acceptance of recycled items. As a consequence, they get lower returns for further investment.

Lastly, according to Dieckmann et al. (2020), most logistical information systems do not support the reverse flow of materials. The lack of sound information systems is one of the most critical issues facing organisations when adopting the reverse logistics. Good support for knowledge is a prerequisite in reverse logistics for successful decision-making. Many companies have sophisticated information and technology systems for forwarding logistics, but additional work is needed to support reverse logistics. Manual data recording is also required because errors can be introduced because of duplication of operations, equipment absence, and inadequate IT tools (Thiyagarajan & Ali, 2016).

H2: There is a significant relationship between knowledge related barriers towards the implementation of reverse logistics.

2.5 Relationship Between Law and Regulation Related Barriers and Reverse Logistics Implementation

First of all, according to Yin (2017), e-waste is illegal in developed countries because of the absence of appropriate legal measures. Therefore, all reverse logistics stakeholders are urgently required to establish an efficient long-term strategy for e-waste disposal and manage informal recycling. Regarded the lack of state assistance as the key obstacle to reverse logistics implementation.

To implement reverse logistics, governments must provide financial support and implement tax regulations. Governments will diminish an organisation's motivation to pursue reverse logistics if they fail to adopt environmental rules that can be implemented (Pacheco et al., 2018). In addition, fiscal policies and government financial assistance are also important. Propose that the government can implement reverse logistics strategies or incentives (Abbas & Farooquie, 2018). We must expect that subsidies from the government will encourage the implementation of reverse logistics. Legislation is a logistic element that goes in the other direction.

The method of analytical hierarchy is used to determine the barriers to implementing sustainable plastic purchasing and supply initiatives in India (Abbas, 2013). The most important of the barriers was considered a barrier, that is to say, government funding and policies. Using the ISM methodology, the main obstacle factors

of sustainability in Indian petroleum and gas industries have been identified and modelled (Raut et al., 2018). The findings showed that the lack of global warming pressure and ecological scarcity is the most critical barriers to other barriers.

According to Lototsky et al. (2019), the ten barriers to reverse logistics in the foundry industry have already been discussed. The most critical factors were present: barriers to progress and advancement were a lack of government control and legislation. There are established impediments and roadblocks for using reverse logistics strategies in Nigerian building enterprises (Dieckmann et al., 2020). The study showed that the lack of legal compliance and government constituted the primary barriers to reverse logistics practices.

It means that either the government does not follow industrial-friendly sustainability policies or offer organisation's unique advantages and incentives for applying them. The laws and regulations of the government are the required instruments for proper corporate governance (Shohan et al., 2020). The industry will inspire top manager companies to introduce reverse logistics in every industry sector by giving strict guidelines on reversing logistics practices and awarding the best reverse logistics guidelines (Kaviani et al., 2020a). The lack of supportive regulations and standards has also been appraised as a critical hurdle to reverse logistics in developing countries. When governments change, so do the guidelines, as witnessed in India. Specific norms and regulations are required to collaborate domestically and create a basic safety standard in the business.

Government laws and financial support can play an important role in reverse logistics practices within an organisation. For example, a lack of enforceable government environmental policy decreases motivation and encourages organisation's to reverse logistics procedures (Badenhorst, 2016). Furthermore, the lack of government fiscal policies and financial support to reverse logistics has disincentivised organisations. The goods returned to the reverse chain contribute to a high degree of tax complexity and exposure. Consequently, the most external effect on reverse logistics activities of a company is government policy.

H3: There is a significant relationship between law and regulation related barriers towards the implementation of reverse logistics.

2.6 Relationship Between Management Related Barriers and Reverse Logistics Implementation

Firstly, according to Starostka-Patyk et al. (2014), in management-related barriers, less cooperative partners within the supply chain are significant challenges in reverse logistics. Therefore, the supply chain could be revamped into the closed or a separate reverse supply chain. It indicated that enormous resources and finance require reverse logistical practices to be introduced.

Next, according to Reddy and Audo (2016), the analysed developing countries could not attain a reasonable recovery rate due to the reduced return volume. Noted

that there are barriers to the technology of reverse logistics practices in return tracking, collaborative with 3PL providers. In knowledge exchange activities such as seminars and conferences, collaborative supply chains are implemented to support practitioner training and growth efforts in environmental matters (Pacheco et al., 2018). The use can treat the waste of different management, such as landfill or waste incineration, and return valuable materials to the supply chain.

By partnering with manufacturers, shippers, retailers and consumers to coordinate green supply chain operations, companies may make significant changes in business efficiency (Ormazabal et al., 2018). They find that environmentally friendly logistics can be used to minimise costs and improve overall manufacturing. Effective reverse logistics networks have shown that good economic benefits can be achieved and corporate competitiveness increased.

As a result, the management's awareness as a strategic decision in developing countries is vital in promoting reverse logistics implementation (Waqas et al., 2018). Although policymakers are crucial for implementing the reverse logistics process, they are concerned about how an inverse logistics system can be initiated and enforced.

Above all, there are numerous impediments to implementing reverse logistics systems, classified as management difficulties in various studies (Aryal, 2020). He identified two significant limitations and drivers of reverse logistics in his research: a lack of understanding of reverse logistics activities and a lack of senior management engagement. Thus, critical impediments to reverse logistics have been discovered. The reasons for these difficulties include a lack of senior management involvement and a lack of concern for green supply chain management in the Indian manufacturing industry (Frei et al., 2016).

Furthermore (Sari et al., 2018), short-term and long-term strategic priorities and high waste disposal costs have also been misaligned because of the lack of a high-level management commitment to logistical sustainability and a top barrier to implementation. Depending on whether these barriers can be eliminated, some businesses can introduce reverse logistics using their self-support scheme, while some organisation's externalise their clients and recycle services to third-party logistics suppliers (Chileshe et al., 2015). A self-support system is suitable for manufacturing high-end electronic goods since it allows a business to gather practical product knowledge for continuous improvement (Ormazabal et al., 2018). It requires, however, considerable expenditure in money.

Top management support and dedication are essential to embrace, incorporate and excel in sustainable practices in every enterprise. Therefore, top management support is vital. In addition, senior management will support a new integrated sustainable structure through employee empowerment, benefits and promotions, training and communication networks through different departments and promoting teamwork (Sivakumar et al., 2018).

H4: There is a significant relationship between management related barriers towards the implementation of reverse logistics.

2.7 A Theoretical Model for Reverse Logistics Implementation

Over several types of research, numerous obstacles to the implementation of reverse logistics have been identified. Even though global awareness, policies, resources, and government backing for reverse logistics is there, most companies saw little to no advantage in applying reverse logistics strategies. While it is generally recognised that reverse logistics is not a necessary process in the majority of the globe, we identify many significant barriers to implementation in the European setting, including a lack of management attention and a lack of acknowledgement of reverse logistics as a competitive element. (Abbas & Farooquie, 2007; Vieira et al., 2020; Campos et al., 2020; Younas & Bajwa, 2019; Kumar, 2017; Lakshmi, 2017; Sivakumar et al., 2018). The above issues can be grouped as financial, knowledge, law and regulation, and finally management.

In Malaysia, the situation is much different. Customers place a higher priority on garbage disposal by contractors, with approximately 80 percent of rubbish generated being sold to individual private collectors and recycled informally (Nik Abdullah et al., 2011). Over 90% of Malaysians are reluctant to pay for waste recycling.

The two main waste collection routes include formal methods utilised by public buildings and more informal options, which involve individual components and raw material sellers. Since the start of informal recycling in numerous locations throughout the world, studies have shown environmental and human health benefits (Abbas, 2013; Vieira et al., 2020; Badenhorst, 2016; Younas & Bajwa, 2019; Raut et al., 2018). However, a high percentage of material in the informal sector never makes it official or formal recycling and disposal sites, limiting the economies of scale in manufacturers' use of reverse logistics procedures (Meyer et al., 2017).

We classify the barriers to reverse logistics implementation into four categories: financial, knowledge, legal and regulatory, and finally, management-related barriers. To investigate these concerns, we found many barriers to the proposed classification that have been described in the literature, which are mentioned below.

Firstly, financial barriers are primarily focused on reverse logistics activities, including a lack of initial capital, an inability to obtain bank loans, increased costs associated with adopting reverse logistics, a lack of funds for product return monitoring systems, a high initial investment with a low return on investment, and finally, expenditure on collecting used products. This is a crucial obstacle for firms seeking rapid advantages from reverse logistic implementation (Waqas et al., 2018).

Secondly, knowledge barriers will include a shortage of reverse logistics professionals, a lack of expertise, training, and experience, and a lack of awareness of reverse logistics practices. Minimal investment in knowledge management and data systems, inaccurate forecasts, a lack of reactivity to reverse logistics, and, finally, an excessively complex implementation. The researcher examines and discusses these barriers to determine the advantage (Tesfaye & Kitaw, 2020).

Thirdly, legal and regulatory barriers include a lack of supportive government policies for reverse logistics, changing regulations as a result of changing political

climates, a lack of restrictions imposed, a lack of enforceable laws requiring products to be returned at the end of their useful lives, customers not being informed about returned products, and finally, a lack of political commitment. These impediments are the subject of research by Chileshe et al. (2015).

Finally, management barriers also include a lack of management support, a poor corporate culture, coordination with third-party logistics providers, waste management issues, and management inefficiencies.

2.8 Theoretical Framework

Figure 1 above shows the relationship between barriers to reverse logistics and the implementation of reverse logistics itself. The independent variable of this study consists of Four (4) factors: financial, Knowledge, Law and regulation, and management-related barriers. Therefore, the dependent variable of this study is Reverse Logistics Implementation within the small and medium enterprises of Pahang. This is in line with the statement made by Waqas et al. (2018); Nik Abdullah et al., 2011; Abdulrahman et al., 2014).

3 Research Methodology

The research design looks at the overall strategy to include components of the analysis coherently and logically (Garbarino & Holland, 2009). For this study, the research design is quantitative. As defined by Sundram et al. (2018), this research is focused on a relationship between two variables in which to learn which variables are related to one another.

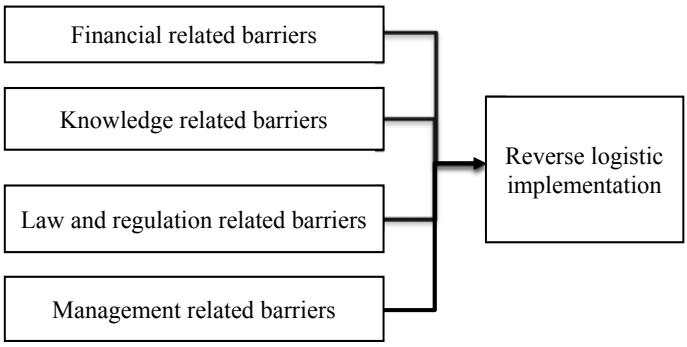

Fig. 1 Conceptual Framework

Descriptive analysis is used to define the characteristics of the population or phenomenon that decides the response to questions about who, what, where, and how (Nik Abdullah et al., 2011; Sundram et al., 2018; Waqas et al., 2018). The present study's objective is to identify barriers to the implementation of reverse logistics in the small and medium enterprise industry and identify types of barriers that primarily affect the industry within Pahang, Malaysia. A survey was used to understand the planned research aims. Questionnaires help researchers discover information from people in a wide variety of fields. (Lau & Wang, 2009).

3.1 Scale and Measures of Research

The first section of the survey assessed the respondent's information within the organisation of the study. The survey question rating scales were based on the Nominal scale, where the respondents will choose what information fits their positions.

The second section of the survey assessed the respondent's attitude about company readiness to reverse logistics implementation. The survey question was, "To what extent do you agree with the following statements for each type of reverse logistic related barriers?" Rating scales were based on a 5-point Likert scale, which one characterised Strongly Disagree, two represented Disagree, three marked either Agree or Disagree, four indicated Agree, and five characterised Strongly Agree. In completing this questionnaire, the respondents were required to think of a situation that they had been involved in or experienced closely.

According to Sundram et al. (2018), population refers to a broad community of people or activities for a researcher. This study's population was all 37,573 small and medium enterprises within the state of Pahang, Malaysia. In January 2019, the number of small and medium enterprise companies in Pahang, Malaysia, was 37,537, at 5.1% of the total number of small and medium enterprises within Malaysia. The sample size is the numerically reflected size of the group selected. The businesses of small and medium enterprises are sufficient to undertake this research. Since the population in this study is 37,573 Companies, a sample size of 81 respondents is appropriate for correlational studies. When it is impossible to obtain such a high return of questionnaires, Power Analysis and Sample Size (PASS2021) suggest that a minimum of 81 is suitable for retrieving data. Non-probability sampling is a kind of sampling where individuals have a zero probability of being chosen. This research used convenience sampling methods to obtain respondents in this survey. This sampling technique is to be used since we are explicitly targeting the population of Pahang.

Data obtained from the survey were reviewed in the last phase of this study. As input, although not used in data interpretation, the quantitative data was used as the sample. SPSS 23 examined quantitative survey results. Descriptive figures and research theories were evaluated for performance. This number of small and medium enterprises will be the base number for the population of this research. These companies' contact details were retrieved from the associated websites of

the Ministry of entrepreneur development and cooperatives (MEDAC) (http://dun.medac.gov.my/data-umum/).

4 Data Collection Method

The tool used for this research was a survey. A questionnaire is a research tool, according to Sundram et al. (2018), consisting of a list of knowledge collection questions. A significant number of participants can compile information within a limited period, and the questionnaires can typically be easily measured and rapidly collected. Therefore, the primary means of gathering data for the analysis was this method.

Survey methods gathered data. An initial email was sent to companies within the small and medium enterprises. Participants represented different industry roles, such as manufacturing, distribution, third party, and retail. Survey questions identified the barriers to Reverse Logistics implementation. Data were analysed by SPSS using the multivariate analysis method. Other aspects, such as company size and industry, were tested to see the difference in reverse logistics barriers and implementation.

Survey data was gathered using an online survey. For this method, Goggle Forms was used as the online survey tool. The key participants were workers employed at this company, such as supply chain managers, logistics analysts, industrial engineers, and the like, working closely to revert logistics projects and processes to find obstacles to reverse logistics. The research covers manufacturers, retailers, vendors, and businesses with services related to electronic goods.

4.1 Research Findings

This section examines the survey respondents' replies in detail. To understand the respondent's perspectives, an attempt was made to relate the participant replies to the theoretical backdrop. Since this research is based on a survey, the number of responses is vital to the study's outcome. Many companies were approached to get data on specific reverse logistics concepts. To begin, the survey data were analysed using descriptive statistics, alpha coefficients, and item-total mean. Next, the reverse logistics obstacles in the industries analysed were evaluated and ranked using factor analysis (FA). Reliability analysis confirmed the questionnaire's validity, with Cronbach alpha values exceeding 0.70, as recommended by [51]. Due to many barriers in our study, we employed descriptive statistics to discriminate between the most and least influential. As a result, the most significant barrier has the highest mean score, while the least important has the lowest mean score.

Firstly, for financial related barriers, the lowest mean was the statement "Higher costs of adopting reverse logistic." The highest mean was the statement, "Non-availability of bank loans to encourage green products processes.". Based on uncertain profit forecasts, the respondents were unable to obtain a bank loan. Reverse logistics implementation in Malaysia is unusual due to small and medium companies being cost-conscious to remain competitive locally and prioritising short-term advantages and profits above long-term benefits. Secondly, for knowledge-related barriers, the lowest mean was the statement "Lack of skilled professionals in reverse logistic." The highest mean was the statement, "Wrong forecasting.". Nevertheless, the largest group of respondents felt that wrong forecasting is within the barriers to implementing reverse logistics.

Thirdly, the lowest mean for law and regulation-related barriers was the statement "Lack of political commitment", and the highest mean, "Lack of enforceable laws on products' return of end-of-life.". However, the largest group of respondents was felt that the lack of enforceable laws and on products return of end-of-life effect the most since it will impact the whole industry. Lastly, the lowest mean for management-related barriers was the statement "Lack of understanding by the top management." The highest mean was the statement, "Lack of waste management practices.". Nonetheless, the largest group of respondents felt a lack of waste management practices that can boost the number of recycled materials to be processed.

5 Study Conclusion

Climate change impacts are becoming increasingly apparent as material costs rise, resources become scarce, and global awareness grows. Achieving a competitive edge while meeting evolving local and international environmental regulations is a common goal of proactive firms using reverse logistics strategies. Malaysian firms must participate in global manufacturing sustainability efforts as resources become limited. Malaysian small and medium enterprises do not sufficiently understand reverse logistics. This study looked at 113 Malaysian small and medium enterprises from various demographics. According to the research's data analysis, most firms included in this study participate in reverse logistics activities and processes ranging from product return collection through refurbishing or recycling. But reverse logistics is relatively new in Malaysia. A comprehensive item-by-item examination of reverse logistics finds investments, resources, and overall commitment to being average. The financial hurdles revealed indicate a lack of company commitment to reverse logistics—even management commitment scores below average. The most significant barrier to adoption is a lack of knowledge of reverse logistics.

According to this study, Malaysian firms, particularly Pahang, are still wary about using reverse logistics. This is due to a lack of awareness about reverse logistics. Despite management's recognition of the value of reverse logistics, the company's expenditures, resource allocation, and dedication remain below average. The most

common reverse logistics activity is collecting customer returns, whereas refurbishing, repackaging, and even recycling are rare operations in the sector. This study has helped firms in Pahang, Malaysia, understand the current level of reverse logistics usage. It also informs businesses, government agencies, lawmakers, managers, and researchers on essential issues that impede companies' use of reverse logistics. This study is also crucial since it tries to determine which reverse logistics operations this firm has implemented. It also shows the significant benefits gained by companies using reverse logistics. This should encourage companies who haven't embraced reverse logistics to do so since it may help them improve their competitiveness.

Reverse logistics implementation provides a wide range of research options. A future study may examine the state of performance in various companies. Although the breadth of reverse logistics deployment varies with every industry, whether independent or moderating and mediating variables, other variables that may influence a company's decision to participate in reverse logistics should be examined.

Notably, the data and results are from a survey exclusively performed in Pahang. Thus, the results do not reflect all Malaysian small and medium enterprises. The research included a limited time for collecting surveys. The questionnaire is distributed as an electronic survey (e-survey) through Google Forms. The inability to ask for a response on the spot or the same day had become a limitation. The data collection is dependent on the sample having time to answer the survey without any option to receive a quick response. A lack of past research studies on the subject revealed a lack of literature for a strong thesis since the number of studies that give the same independent and dependent variables is limited. Even while most research on reverse logistics implementation recommends additional variables be considered, the results of this study utilising reverse logistic barriers as a significant variable have proved to be highly beneficial.

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Does Customer Loyalty Lead to Successful Automotive Industry? a Study of Malaysian Consumer

Mohd Syafiq Ruslan, Nurhanan Syafiah Abdul Razak, Musmuliadi Kamaruding, and Muhammad Alshurideh

Abstract Customer loyalty is the performance index that is being inspired by many companies to ensure their businesses are profitable, sustainable competitive, expandable, and practical in the current era. On a similar note, customer satisfaction plays a big role as indicators to connect the customer to a company in which expressed their experiences and values owning a brand new car from a company. Derived from customer satisfaction leads to customer loyalty which is a customer is likely loyal to a brand and inspired to buy a new car from the same brand. Competitive advantages are the key factors that contribute to customer satisfaction and customer loyalty. One of the challenges is related to market uniqueness in which a company required special strategies to offer a product that suits the demographic of the customer which will have a significant impact on the competitive advantages for a company. The research is to examine the correlation of competitive advantages towards customer loyalty specifically in Malaysian automotive industries. This correlation study will utilize quantitative methodology and the data will be analyzed and interpreted through IBM

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_127

SPSS. As a note to research scholars and future research undertaking, this research can be used as guidance to other automotive brands either national or non-national segments.

Keywords Customer loyalty · Competitive advantages · Market uniqueness · Price Tag · Leadership · Product Feature

1 Introduction

In terms of automotive industries, vehicles are essential for everyone nowadays as transportation to commute from one place to another place. Due to the uprising demand for vehicles, automotive industries getting expand globally thus competition between car manufacturers are competitive. The automotive business already passes a century old, "yet it remains one of the most competitive businesses on earth" (MAA, 2020). Edward added that over the past few decades, the competition keeps competitive in the U.S industries where recent market entrants such as car brands from China and Korea making the road into the markets. This situation not only occurred in the U.S, but the whole region already faces the challenge condition which entrance of another foreign brand to the domestic market.

The performance of global automotive industries can be measured based on sales and production of vehicles. Ministry of International Trade and Industry (MITI) summarized and conclude the market situation and economic climate change from 2014 to 2018. Vehicles have been sold in the year 2018 have recorded 7.7% positive growth from 2014 to 2018 which the value from 85.3 million units to 91.9 million units. As for global production statistics, increasing from 87.6 to 95.2 million units from 2014 to 2018. The explanation above support by Fig. 1 shows the global sales and production achievements from the year 2014 to 2018 (MAA, 2020).

2 Background Study

The automotive industries in the ASEAN region growth by 12% for sold units and 10% for production vehicles from 2014 to 2018. This increasing trend is mainly due to ASEAN countries offers investment opportunities for distributors and manufacturers. Japanese-based OEM dominated the market segment in ASEAN. The result can be seen in Fig. 2.

Based on Fig. 3, total sales vehicles production in 2019 is 4,158,983 units in the ASEAN region which Thailand nominates the highest number of production followed by Indonesia and Malaysia.

Indonesia and Thailand are the automotive hub of ASEAN which almost of suppliers localize their parts in both of the countries especially for Japanese car manufacturers such as Toyota, Daihatsu, Honda, Mazda, and others (BOI, 2015).

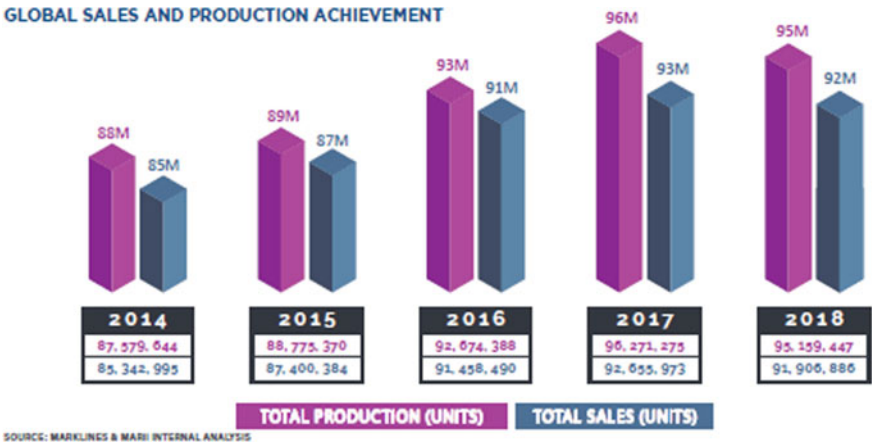

Fig. 1 Global sales and production achievement (MAA, 2020)

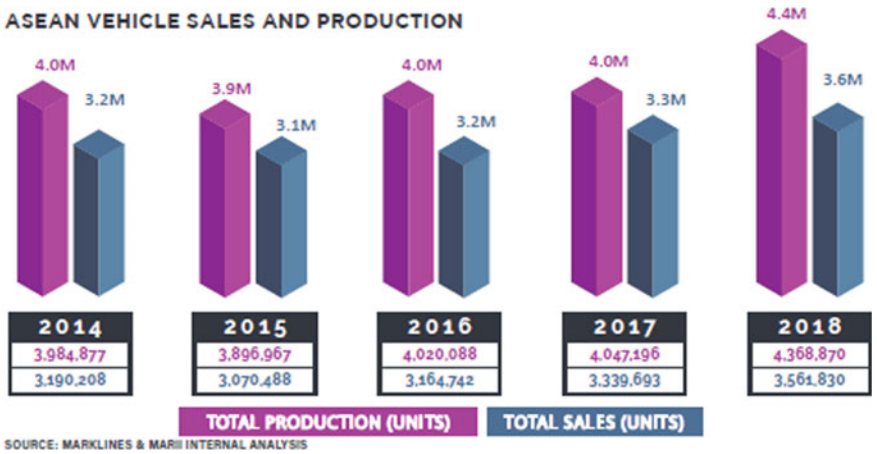

Fig. 2 ASEAN vehicles sales and production (MAA, 2020)

Hence, both of the countries enjoy the benefit of lesser tax imposed, high production volume thus contribute to high revenue. Competition between car manufacturer at Thailand and Indonesia are competitive since both of the countries are having open policies to any brands and don't have the policy to consider the impact towards national car compare to Malaysia (BOI, 2015).

The Malaysian automotive industries are unique compare to major automotive players which are national brands consist of Proton and Perodua. Figure 4 shows that Perodua holds 43.7% while Protons holds 18.2% in the year 2019. Thus, national car nominates more than 50% of the total industry volume (MAA, 2020).

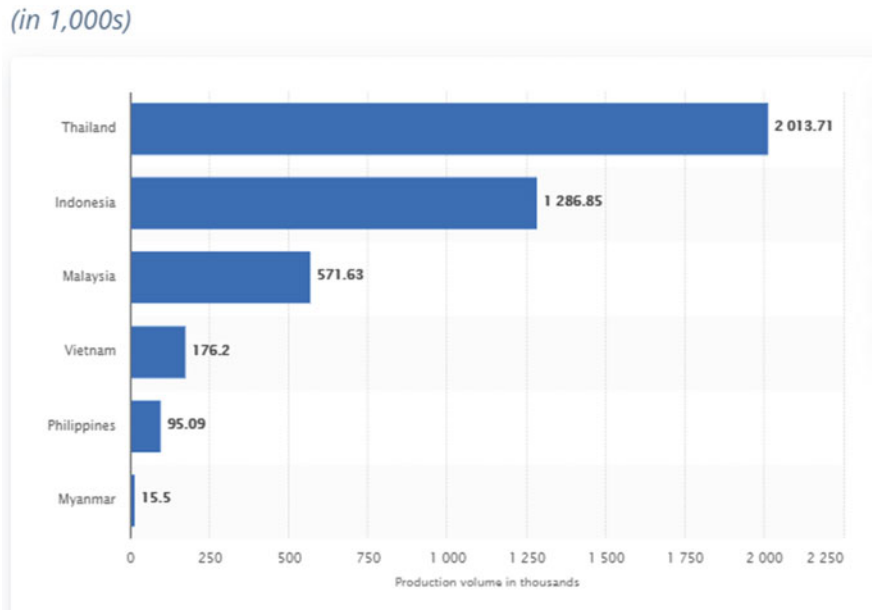

Fig. 3 Production volume in 2019 by country (MAA, 2020)

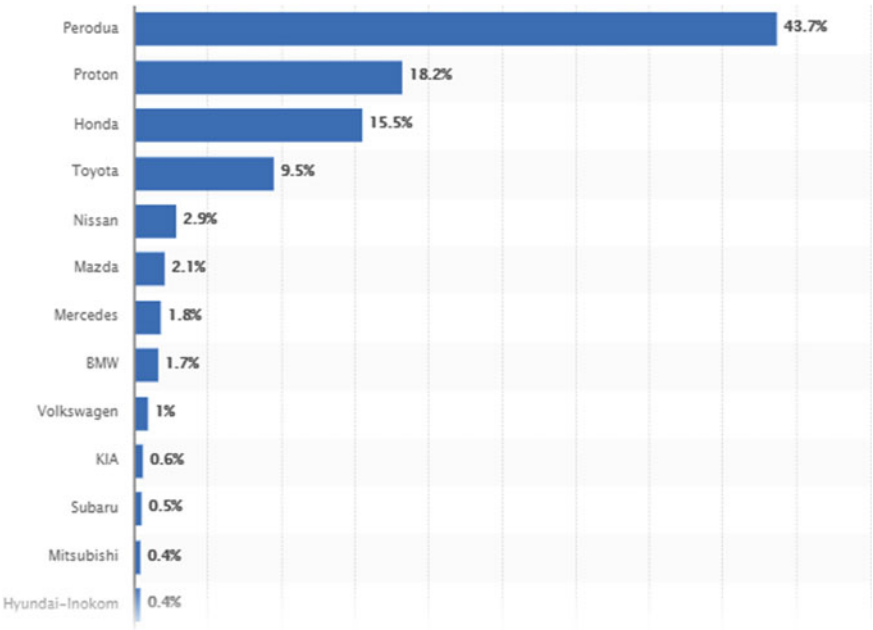

Fig. 4 Market share by brand 2019 (MAA, 2020)

The market share explained above shows that there are huge differences between total sales between national segments which are Proton and Perodua compare to other non-national brands. ABC Company which is a key player in the non-national segment in Malaysian automotive industries by holds a big percentage in market share in total industry volume especially in the non-national brand segment. Several achievements have been recorded for the years of 2020:

(a) ABC Company being nominated as number one for the non-national segment for six consecutive years from 2014 until 2020. (Awarded by MAA)
(b) ABC Company was nominated as first runner-up for Malaysia's 100 Leading Graduates for the automotive segment for the year 2020. (Awarded by GradMalaysia)
(c) ABC Company awarded as the Best Employer Brand Awards for the year 2020 (Awarded by Employer Branding Institute)
(d) ABC Company awarded as Most Attractive Graduate Employer to Work in 2021 (Award by Talentbank).

Despite recognition received by ABC Company, there is a little guarantee on the customer preference, market situation, customer demand, customer perception, and other factors that will determine either ABC Company will keep expanding as the customer loyalty increase or being overtaken by other competitors due to potential of customer brand switching. A previous study conducted by Ariffin and Sahid (2017) on the competitiveness analysis of ASEAN automotive industry, (Wad & Chandran Govindaraju, 2011) on the Malaysian automotive industry development assessment, (Tai & Ku, 2013) on the political-economic analysis of automotive industrial policies in Malaysia and Thailand, and other general study related to competitive advantage and customer loyalty either in Malaysia context or globally. There is a limited study conducted for non-national automotive industries in Malaysia especially in ABC Company on the dimension of competitive advantage that contributes to customer loyalty.

3 Literature Review

3.1 Customer Loyalty

Customer for current era and generation is different compare to previous decades since the customer has sort of information and choices for a product and services which every company tries to penetrate and emerging market over globally. According to Juanamasta et al. (2019), the role of customer service is essential to create customer loyalty by providing quality service to the customer by implementing Customer Relationship Management (CRM). CRM is a helpful tool to have communication with the customer is deemed very effective in delivering services to them. This can be the basis of acquiring new customers, care, maintaining, and

developing customers. Many problems faced by a company lead to a bad image and will reduce the level of customer loyalty. Service to the consumers is very important in increasing the satisfaction of them then increase the intention to re-purchase or have deals with the same company as a sign of loyalty (Juanamasta et al., 2019).

Another perception from a profound study conducted by Xhema et al. (2018), on the corporate image, switching cost, and product quality can affect customer loyalty in which companies are highly oriented customers and become a center of attention. Companies invest in the database which required huge amounts of money, so they can focus on customers that bring more profit to the company. Thus, many global companies focus on penetrating the market to gain new customers however new customers cost a lot of time and money due to required information on customer preferences, forecasts, databases, and find solutions. Alternatively, focusing on loyal customers seems to be difficult but can reduce costs and improve profitability. Thus, essential for a company to enhance its competitive advantages so that it can improve on customer loyalty.

In terms of automotive industries in Malaysia, there are relationships between service quality, customer loyalty, and brand image after sales at national automotive service centers in Malaysia (Saidin et al., 2020). According to the study, customer loyalty was affected 87% by brand image and service quality at the service center. Customer satisfaction in terms of service quality will directly correlate with customer loyalty. This will help to deter customers from switching to another brand. There are 27% of consumers reported switched to another brand due to not meet their expectations. This study is conducted on a national carmaker which is Proton. Proton was able to get the highest sales during the early years of introduction among ASEAN countries however, already fell to third place due to stiff competition with other brands.

Various study has been conducted previously prove that the behavior of customers changes drastically. Scherpen et al. explained in the research entitled customer experience management to leverage customer loyalty in the automotive industries, management plays a big role in the current digital age to reach sustainable enterprise and long-term customer loyalty. According to a survey conducted and Germany, France, and the United Kingdom about the relevance of customer experience management, 70% of the sample test believed that this approach was a central success factor for their company strategy in the digital age. Dr. Dieter Zetsche, Head of Mercedes-Benz Car and Chairman of the Board of Management of Daimler AG stated that: "We are transitioning from car manufacturer to networked mobility provider, whereby the focus is always on the individual—as customer and employee" (Daimler, 2016).

Based on the above literature mention that customer loyalty is the major factor that contributes to profitability and enterprise growth. Most of the studies conclude that after-sales quality, customer relations, corporate image, and others contribute to customer loyalty. However, there is a limited study related to customer behavior on purchase intention due to competitive advantages of a company based on product offer to them such as market uniqueness, price tag, leadership, product features, and promotion. Thus, essential to extend the study on this dimension to determine either have a positive correlation with customer loyalty.

3.2 Competitive Advantage

The automotive industry in ASEAN already passed thirty years under different automotive policies, regulations, and approaches leasing to variation of performance among the countries. Ariffin & Sahid, (2017), conducted a study related to comparative analysis of ASEAN automotive industries which compare between Malaysia and Thailand industries. The differences between both Malaysia and Thailand are mainly due to the policies adopted in which Malaysia utilizes independent development while Thailand utilizes dependency development (Wad & Chandran Govindaraju, 2011) as shown in Tables 1 and 2.

The 'Independent development" strategy is applied to establish a national brand while "dependency development" has made its domestic automotive industry as a part of the worldwide supply chain (Tai & Ku, 2013).

In the study utilizing Porter Five Forces analysis (Ariffin & Sahid, 2017), compare: (a) bargaining power of buyer, (b) bargaining power of supplier, (c) threat of substitute product, (d) threat of new entrant, and (d) intensity of rivalry which leads to the conclusion of Malaysian automotive industry is at the turning point which will see a huge potential for foreign investor or MNCs to invest and expand in Malaysia such as the latest condition on 2018 where a strategic partnership occurred between Geely Auto and Proton as China is the largest car manufacturer in Malaysia compare to Thailand which already saturated and dominated by Japanese and American manufacturers. Below Fig. 5 presented the comparison between Thailand and Malaysia.

According to a different researcher, (Wad & Chandran Govindaraju, 2011), argued on the assessment of Malaysian automotive industry development: (a) Why the Malaysian-controlled automotive industries have not become internationally competitive, and (b) whether Malaysian automotive sector can become a regional and global

Table 1 Automotive Policy /Strategy Malaysia vs Thailand (Wad & Chandran Govindaraju, 2011)

Automotive Policy 1 Strategy	Advantages	Disadvantages
Thailand Dependency Development!	• ••Smaller financial burden, on. the government • ••Less Pressure on she opea market	» Hie' automoave industry Ls dominated by foreign capital * More difficult to develop the economic scale of mass production § Cannot bring about the growth of rekted industries
Malay & La Independent Develop mean	• ••Protection brings mass production • ••More likely to support the growth of related industries • ••Can use th.fr home coimtiy[1]s resources	§ Greater financial burden on the government * Over-protection cannot res-pond no pressure from trade liberalization

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Table 2 Comparative Automotive Policy of Thailand and Malaysia (Tai & Ku, 2013)

Thailand	Malaysia
• Increasing Productivity by develop Thailand automotive industry to an industry wide lean supply chain and. creating production supply chain network to enable comparison of competitive advantage, thereby mate Thailand automotive industry highly competitive • Expanding domestic and ASEAN markets by developing smaLl passenger car together with maintain Thailand position as the production base for pick-up truck. Also develop infra sanctures to increase efficiency in transportation • Develop design and engineering Technology as a foundation of sustainable and systematic competitioa and value creation, using technology roadmap as an. esseatial tool to enable collaboration, oa research and. development and testing projects • Develop human resource by incus ay-wide development of human resource in management and production. Human, resource development is a key factor in. creating competitive advantage for Thailand automotive industry emphasising on formal education system, training system thai meet the industry demand • Promote domestic and. foreign Investment to promote the industry growth and linking to international Level	**To develop a competitive and capabLe domestic automotive incus ay *To develop Malaysia as the regional automotive hub m Energy Efficient Vehicle (EEV) **To Increase value-added activities in. a sustainable way while continuously developing dom^sac capabilities *To Inc rease exports of vehicle s. auto mo tiv e components, spare partis and related products In the manufacturing and after market sectors *To Increase the participation of competitive Bumiputera companies in the domestic automotive industry, meluding in the after-market sector *To safeguard consumer interests by offering safer and better quality products at c ompe titiv e p tic e *To enhance the ecosystem of the manufacturing and after mark en sectors of the domestic automotive industry

in the export industry? (Wad & Chandran Govindaraju, 2011) criticizes that the automotive industries still lack of product upgrading and technological specifically among parts and component supplier, weak global marketing capabilities and low level of skills among employee. Another criticizes for the stimulus packages offered by the government which targets the national automotive sector only, thus discriminate against the non-national brand and turning them not to invest in Malaysia.

Another perspective study conducted by Mohd Rosli (2012) on the Malaysian small and medium enterprises competitive strategy, there are several findings which are: (a) price setting, marketing, and promotion are the most competitive strategies emphasized by manufacturing SMEs, and (b) Less exposure and adoption of innovation and global orientation in their competitive strategies in which low investment on R&D and least emphasis on the application of internet in business to go global. The study conducted by Mohd Rosli (2012) may reflect on the local automotive supplier in which supplies to the car manufacturer however, the study more focus on food and beverages (F&B) and textile and clothing (T&C) industries.

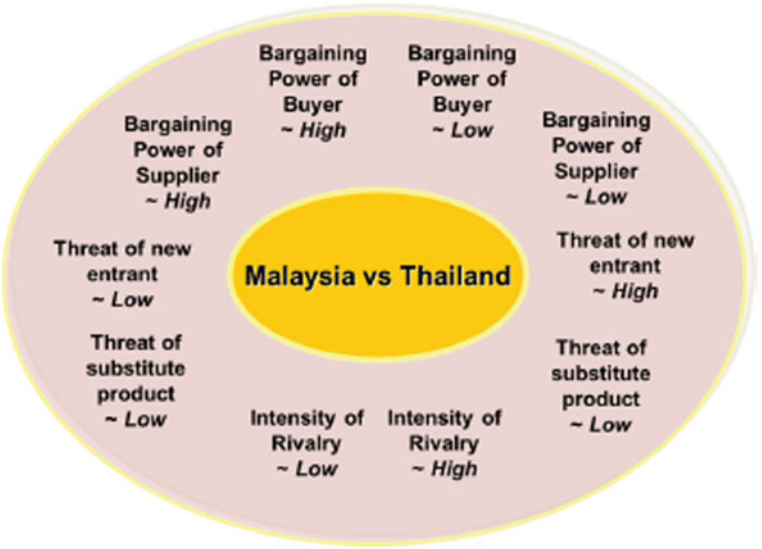

Fig. 5 The five competitive forces analysis for automotive components and parts industry (Ariffin & Sahid, 2017)

There were limited studies on the factors that contribute to the competitive advantage of automotive industries MNC in Malaysia. One of the researcher's objectives is to add to the existing theories or works of literature and to increase value to the body of knowledge especially in the automotive industry.

Previous studies on competitive advantages, a lot of dimensions have been tested towards customer loyalty in various industries such as policies adopted by the government in Malaysia (Ariffin & Sahid, 2017); 4Ps concept in related to influence customer (Büschken, 2007); market uniqueness and environment in ASEAN (BOI, 2015); inter-relation between price offer by a brand at a store with the perception of brand, perception of store and perception of price that will lead customer to have perceived of quality, thus customer will have perceived on the amount of sacrifice needed to purchase a product (Dodds et al., 1991); strategic alliances through good leadership conceptualized on how the China banking industry to keep competitive (Chia, 2009); assessment of automotive industry development in Malaysia that the combination of high marketing and high technology in the industrial policies will attract and nursing FDI in strategic sectors of economic development (Wad & Chandran Govindaraju, 2011); price setting, marketing and promotion, exposure and adoption of innovation and global orientation lead to low investment on research and development (Tai & Ku, 2013); dependency development or independent development adopted by government either protect national car or open market strategies (Tai & Ku, 2013); utilizing Porter Five Forces analysis to compare each competitors through: (a) bargaining power of buyer, (b) bargaining power of supplier, (c) threat

of substitute product, (d) threat of new entrant, and (d) intensity of rivalry which lead to the conclusion of Malaysian (Ariffin & Sahid, 2017).

Based on the literature explained above, the researcher extends this study in dimensions of competitive advantages which relevant to customer loyalty specifically in automotive industries such as: (a) market uniqueness, (b) price tag, (c) leadership, and (d) product features. The literature for the aforementioned dimensions will be elaborated on in the next section.

3.2.1 Market Uniqueness

Over the last three decades, the marketing literature focused on brand studies which are mostly due to brand image. If the company creates strong brand values, the customer will surely seek the value of the brand and reject other alternatives. However, in the current globalization era, consumers have a lot of brand selection with the most identical value, thus consumers have a lot of alternatives. According to Lanza, (2008) , in the automotive industry for the past 30 years in U.S automotive industry, car manufacturers over-manipulated their brands and made the marketplace confusing by offering conflict of brand image, therefore diluting all of the values offer by others and become the most desirable automotive brands.

According to Dodds et al. (1991) on the research related to effects of buyers' product evaluation based on the store information, price, and brand, there are key determinates of brand satisfaction is related to market uniqueness such as: (a) quality, (b) value, (c) equity, (d) brand commitment, (e) interact to discover brand loyalty and (f) repurchase intention. Specifically, (Dodds et al., 1991) point out that superior financial performance, loyalty, and customer retention are linking to brand satisfaction, quality, commitment, and value.

In the 1950s, marketing theories being developed to include the exploitation and manipulation of market demand by winning the battle for customer's choice (Gupta & Wang, 2007). Marketing mix strategies being adopted by MNCs as defined by Büschken (2007) related to influence customer demand. The 4Ps concepts which are: (a) the product or service, (b) the price imposed and the terms associated with the sale, (c) promotional, communication activities, and advertising, and (d) the place where the product was sold including the logistics and distributions process involved.

A profound study conducted by the Thailand Board of Investment, Thailand being nominated as the automotive hub of Asia as become the biggest automotive producer in ASEAN and also being number 12^{th} in the world. Thailand expects to increase its production by 3.5million units in 2020 or definitely increase 80% compared to 2016 (BOI, 2015). Thailand Board of Investment mention the market of Thailand is unique to other countries in ASEAN due to the uniqueness of the market and environment which are:

(a) The geographical advantage which Thailand is located at the center of Indochina Peninsular thus connected with 2 billion people in ASEAN and China by land and sea with world-class infrastructure provided. Furthermore, the third phase

extension of Laern Chabang deep-sea port is expected to provide capacity up to 3million cars being export.

(b) Eastern Economic Corridor (EEC) which Thailand promoted 13,285km^2 of EEC due to the advantage of automotive production is reinforced and developed by supporting facilities and special investment policies. An example of advantage is EEC will provide National Automotive Tire and Testing Centre which is the only testing center in ASEAN and ready for tire and carmakers in 2018.

(c) Abundant skilled labor which Thailand consists of 600,000 workers in automotive industries in 2016 with the advantage of 29 universities and other institutes which provide automotive and mechanical engineering programs that will lead to an adequate supply of graduates and forecasted by 2021, 61% of all workforces in Thailand industry are high-skilled labor.

(d) Research and development (R&D) which most of the car manufacturers in Thailand established their R&D such as: (1) Toyota Motor Asia Pacific Engineering and Manufacturing, (2) Nissan Technical Center South East Asia, (3) Isuzu Technical Center of Asia, (4) Honda R&D Asia Pacific and (5) Mitsubishi Motors Proving Ground.

(e) Investment incentives linked with national development activities which wide range of tax and non-taxable incentives being offered by the Thailand Board of Investment such as corporate income tax exemption for 8 years without a cap for research and development activities.

3.2.2 Price Tag

According to Gupta and Wang (2007), "designing products and services that can be manufactured and delivered at ultra-low prices while yielding satisfactory profit margins". This statement is supported by Knab (2008) on the research study going global by implementing re-invention that requires products and services that can be manufactured and delivered at ultralow prices while the profit margin is at a satisfactory level. Toyota Motor Corp.'s launched efforts to develop and manufacture an ultra-low-cost car for an emerging market such as India, China, and other emerging markets as an approach.

Knab (2008) on the same research found that most of MNCs focus on selling products identical and similar to those in their domestic markets, thus the product offers higher quality and sells at the higher price, therefore, targeted to the wealthy customers because of status associated with owning imports, their designer nature, and inherent quality. The draws by implementing this strategy only allow MNCs to capture a small percentage of the total market while they rather than focus on potential mass-market consumers at the bottom of the economic pyramid.

Based on the profound study by Juanamasta et al. (2019), there are inter-related between the price offered by a brand at a store with the perception of the brand, perception of the store, and perception of the price that will lead the customer to have perceived of quality. Then customers will have perceived the amount of sacrifice needed to purchase a product. Combining both perceived quality and price will

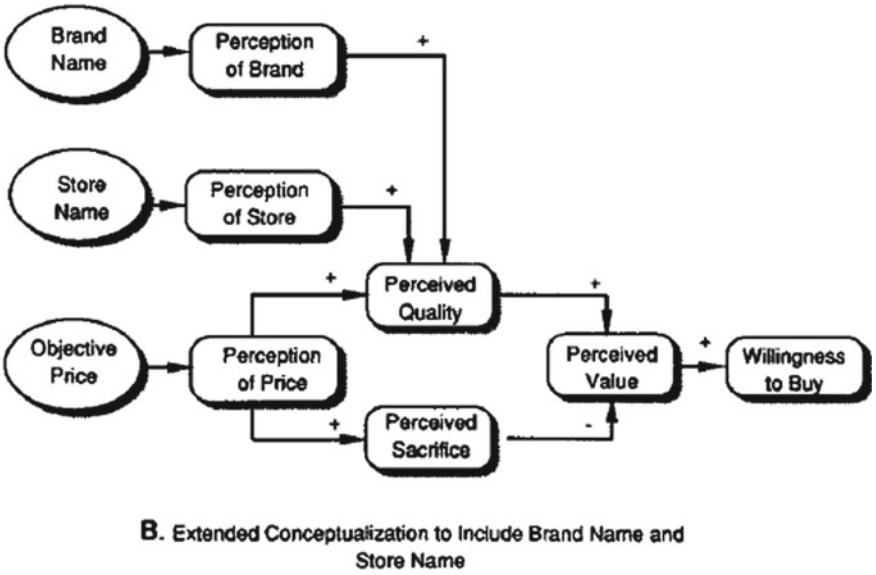

Fig. 6 Conceptualization of brand name, store name, and objective price (Juanamasta et al., 2019)

determine the perceived value that will turn directly influences willingness to buy. This correlation can be seen in Fig. 6.

According to Büschken (2007), although customers mostly seeking for low-priced, arguably cars do not fall into this category which cars represent almost a major percentage of household's consumption expenses and use for a longer period. In addition, certain aspects of new cars such as durability, maintenance cost, and resale value cannot be determined before purchase, thus can be concluded purchase of a new car is risky. Büschken (2007) conduct research on attributes that lead the customer to have purchase intention which are: (a) reliability, (b) workmanship, (c) price worthiness, and (d) service quality that brand's dealer.

According to Young (2014), there are two views on the price effect towards competitive advantages in study regarding competition between private labels and national brands for fresh milk. As for (a) competitive view, lower-priced for the private label will provide an incentive for a national brand to lower price to be competitive in the market. (b) Market segmentation view which the introduction of private labels leads to higher branded prices. (Young, 2014) explained most retailers have the ability on pricing power, so they have an incentive to raise their brand price and induce customers to switch from the national brand since retailers earn higher margins on their brand.

Ariffin & Sahid (2017) mentioned that interest rates for the car loan and fuel price also contribute to the price offer. Overall interest rate levels remain quite low and also easy to get loan approval to encourage many young graduates to manage to own

national cars for the first few years and the experience or other professional workers most likely upgrading from national car to non-national brands.

3.2.3 Leadership

According to Northouse (2012), there are four elements in leadership: (a) leadership is a process that leaders use to affect a group of people, not a trait or a characteristic of leaders nor a one-time event, (b) leadership involves influence to affect followers' behavior and minds (c) leadership occurs in a group situation, not in single person context, and (d) leadership involves the same goal with the team as a common goal.

Based on profound research conduct by Matsui (2013) related to leadership development of western companies in Japan, only 29% of the U.S workforce is properly engaged and almost 71% does not have proper engagement with leaders and management, thus influence organization productivity thus cost incurred huge amount of dollars every year. Besides productivity, employee disengagement leads to increase turnover cost which the cost impacts two times employees' annual salary. Matsui (2013) added that the impact goes worst with the industrial restructuring, series of specific changes in acquisitions and mergers on a global scale resulting in the weakened economic power of corporations. Effective leadership is one of the keys to increasing productivity and employee engagement.

According to Israel (2018), leadership is one of the major factors that contribute to a company which top executives are responsible towards that as well as designing conditions that can guarantee organization survival. Business organizations need leaders who understand how to handle organizational issues and work closely with culturally diverse employees and customers. There is the impact of strategic decisions fail due to mistakes of the top executive which are: (a) their personal interests interfere with their vision for the organization; (b) they are involved in, or accept, unethical behavior; (c) they have disregard for quality, innovation, and productivity, depending too much on intuition to the detriment of logical analysis; or (d) they allocate money and time injudiciously or irresponsibly.

Chia (2009) conceptualizes that in the globalization era and under exaggerate competitive environment, enhancing competitive advantages are the key towards that. Based on the profound research on the China banking industry to keep competitive, three variables contribute: (a) Strategic alliances by linking with a partner to acquire capabilities and resources could enhance competitive advantages, (b) relational asset enhancements by building relational capital with alliances that beneficial for learning, know-how transfer and, (c) linkage for assets exchange between alliances. Chia (2009) added that the foundation of relational capital includes relationship building, respect, friendship, and mutual trust in the alliances. Foreign banks could invest in the domestic bank as competitive advantages in the Chinese market which consists of a unique socio-economic environment and culture.

In terms of Malaysia perspective, (Ariffin & Sahid, 2017) explained in the threats of new entrants for the comparison between Malaysia and Thailand automotive industries, Thailand will continue with the domination of Japanese manufacturers, thus

allowing the potential for global Original Equipment Manufacturer (OEM) companies to invest in Malaysia. This correlation is proven by Ariffin and Sahid (2017) on the strategic alliances between Proton and China automotive Geely foresee the new entry of components manufacturer in Malaysia.

Tai & Ku (2013) added that the decision of strategic alliances by leaders will determine the competitive advantages of Malaysian automotive MNCs although the policies regulated is protective for the national brand such as Proton and Perodua. Examples of the strategic alliance such as DRB-Hicom and Honda, UMW and Toyota, Mazda and Bermaz, Naza with Kia, and Inokom with Hyundai. The strategic alliances offer competitive product offer to the local marketplace. The argument can be supported by the decision of manufacturers either to fully import completely build units (CBU) or manufacture in Malaysia through a complete knockdown scheme (CKD) in which the tax and incentive offer has a huge difference. Hence, local assemble CKD will have better advantages (MAA, 2020; MITI, 2014).

3.2.4 Product Feature

Wad & Chandran Govindaraju (2011) explained in the assessment of automotive industry development in Malaysia that the combination of high marketing and technology in the industrial policies will attract and nursing FDI in strategic sectors of economic development. Local manufacturers and firms are unable to excel in both high marketing and technologies except to increase their competitive advantages through import and adopt the technologies from a developed country such as Japan, United Kingdom, Germany, China, and others. Wad & Chandran Govindaraju (2011) added that average around 2% of investments in R&D and technology which are still low in Malaysia durin the period of 2000 to 2005 and spending only 0.14% on other equipment manufacturers.

According to Tai and Ku (2013) in a thesis related to the comparative political-economic analysis of automotive industrial policies between Thailand and Malaysia, criticize the automotive industries in Malaysia is way behind compared to Thailand. From the perspective of the economic point of view, the competitive advantages of Thailand automotive industries lie into following elements: (a) industrial technology, (b) export capabilities, (c) product cost, (d) manufacturing capacity, and other measures of industrial competitiveness. The details in Table 3 show the comparison between Malaysia and Thailand based on research by the Japanese Automotive Manufacturers Association (JAMA).

Tai & Ku (2013) added that the government keeps continuing its protection and intervention although Malaysia set up the industrial scale of automotive industries, Malaysia still not consider as industrial self-reliance. The policy of state protection caused complacency and laziness in operations, and the local management lacks the power to seek for cost optimization, thus lead to low production efficiency. On other hand, Thailand's automotive industries courted MNCs by brought capital and also advanced management and technology methods.

Table 3 JAMA Manufacturing Capacity Ratings for Thailand and Malaysia (Tai & Ku, 2013)

Item	Thailand	Malaysia
Engine	High	Low
Engine parts	Hifih	Low
Electronic systems	Hifth	Standard
Braking system	Standard	High
Interior	High	Low

The current study conducted by MITI (2014) as the review performance of NAP 2014 which is the third version after first introduced in 2006 and second revision in 2009 stated that the key objective of NAP 2014 was to be ASEAN hub for Energy Efficient Vehicles (EEV) through the R&D development, right-hand drive (RHD) vehicles development capabilities and associate technologies such as light material, fuel efficiency, telematics, component design, and tooling. The effort by the government to provide facilities for automotive technology by the establishment of Centers of Excellence (COE) which is the technology centers (MAA, 2020) such as (a) Malaysia Technology Center, (b) National Test Center to implement and educate supply chain and also car maker to utilize Industrial Revolution 4.0, and (c) Automotive design center.

In connection with above mentioned on the key achievement of Ariffin and Sahid (2017) supported that the third version of NAP will see a positive impact for foreign investors to invest in Malaysia after once dominated by the domestic market. This is due to the protective policies have been amended and strategic alliances between national brand, component manufacturers with foreign investor already emphasized towards the fourth revision of NAP which is NAP 2020. The NAP 2020 will continuously cultivate the participation of local car manufacturers and suppliers in both global and domestic supply chains, encourage R&D, and build capacity also capabilities of the local workforce, and enhancing investments, exports, and local production volume.

3.3 Relationship Between Competitive Advantages and Customer Loyalty

The aforementioned literature in the previous section explained the selected dimensions of competitive advantages such as: (a) market uniqueness (BOI, 2015; Gupta & Wang, 2007), (b) price tag (Ariffin & Sahid, 2017; Dodds et al., 1991; Young, 2014) (c) leadership (Israel, 2018; Matsui, 2013; Tai & Ku, 2013), and (d) product features (MAA, 2020; Wad & Chandran Govindaraju, 2011). Four hypotheses have been constructed to verify the correlation between the dimension of competitive advantages and customer loyalty:

H_1 Market uniqueness has a direct positive influence on customer loyalty.

H_2 Price tag has a direct positive influence on customer loyalty.

H_3 Leadership has a direct positive influence on customer loyalty.

H_4 Product features have a direct positive influence on customer loyalty.

4 Theoretical Framework

Customer loyalty is being utilized as an indicator of competitive advantages for a company. There is much literature, modern research on customer behavior in dealing with factors that contribute towards customer loyalty. The theories have been extracted from a theory explained by Shiftan et al. (2015) with research on measuring passenger loyalty to public transport modes. Customer loyalty is derived from three types of product values which are; (a) switching value which reflects the technical effort in switching from one product to another; (b) hedonic value which captures the reflection of emotion experienced by the consumer associated with the products in their mind; and (c) utilitarian value in which represent the functionality of the product to the consumer (Shiftan et al., 2015). The outcome obtained from the model yields the level of satisfaction and repeated choice of products. Satisfaction is the 'consumer fulfillment response … a judgment that a product or service feature, or the product or service itself, provided a pleasurable level of consumption…,' whereas loyalty is a 'deeply held commitment to re-buy or re-patronize a preferred product or service consistently in the future (Oliver, 1996), emphasis added).

Satisfaction is described as a short period judgment of the product, hence loyalty reflects the consumer's commitment and attitude toward the product in the long term. Loyalty creation has been divided into four stages (Oliver, 1996):

(a) Cognitive loyalty is described as knowing—the loyalty created after a short experience with the product, based on the level of satisfaction with the product's physical characteristics.
(b) Affective loyalty is described as an attitude—the creation of an attitude toward the product after a significant period of experience, including a personal commitment toward the product.
(c) Conative loyalty is described as intention—the creation of intention to re-buy the product and an emotional feeling toward the product.
(d) Action loyalty described as re-buy—the highest level of loyalty, involves automatic re-purchasing of the product and blindness to competitors.

Based on literature explained and underpinning theory related to the dimension of competitive advantages in relation to customer loyalty, a research conceptual framework has been constructed to test the direct correlation as below (Fig. 7).

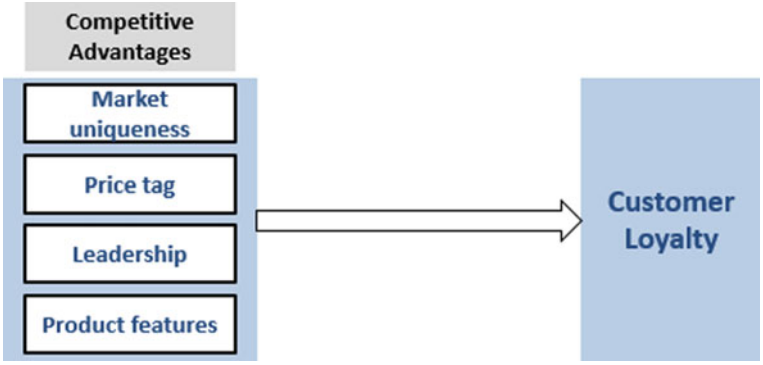

Fig. 7 Research conceptual framework

5 Research Methodology

This research objective is to study dimensions of competitive advantages towards customer loyalty for Malaysian automotive industries in Malaysia. Therefore, a non-experimental design method being implemented which correlation study was conducted to test dimension (independent variables) towards the customer loyalty (dependent variable). Research design is the key structure and strategy to be adopted by the researcher efficiently and effectively throughout the research (Hair et al., 2007).

Based on the previous literature as discussed in the following studies (Mohd Rosli, 2012; Ariffin & Sahid, 2017; Barney, 1995; Knab, 2008; Israel, 2018; Tai & Ku, 2013; Wad & Chandran Govindaraju, 2011), the researchers who had performed similar studies i.e. factors contribute to competitive advantage preferred to adopt the quantitative analysis method. According to Ticehurst (2000), the quantitative analysis method is dependent on numerical results and provides conclusions in systematic ways. Another advantage of utilizing the quantitative analysis technique provides a wide range of research coverage, and it is more efficient, effective, and economical.

All of the data gathered were verified and analyze through Statistical Package for Social Science (SPSS—Ver.22) tools, therefore the outcome such as correlation coefficient, reliability and validity, and multiple-regression are accurate (Ticehurst, 2000).

The methodology of this research is conducted and ends with validity and reliability. The purposive population is consists of 10,000 customers who still choose to maintain and service in ABC Company although their warranty already expired at Melaka region only through convenient sampling method. Thus, recommended sample based on (Krejcie & Morgan, 1970) is 370 respondents to obtain appropriate and accurate data. In the next study, the research design and data analysis method were executed and being performed to interpret the data to collect from the respondents. The data will be translated into figures, tables, and charts, thus easy to analyze and interpret.

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6 Conclusion

Based on the background study, literature from previous researchers and a pertinent study conducted on the customer loyalty, hypotheses, and research framework have been constructed to verify the correlation between the dimension of competitive advantages such as market uniqueness, price tag, leadership, and product features towards customer loyalty. This research is important to study the dimensions that lead to answering why the customers are loyal to a significant brand, thus ABC Company can have a special marketing strategy and improve their customer relationship in order to keep enterprise growth and sustainability in Malaysia.

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Factors Influencing Car Buyers Purchase Decision During COVID-19 in Malaysia

Mohd Fadzly Suboh, Nurhanan Syafiah Abdul Razak, and Muhammad Alshurideh

Abstract Consumer behaviours are largely regulated by multiple factors from need recognition to search for products that would satisfy their requirements. The study in context to car purchase behaviour among the Malaysian consumer highlights increased car buying trends among the Malaysian consumers during the pandemic. Social distancing along with prohibiting the usage of public transport has increased difficulties of consumers thereby resulting in an increased tendency to opt for personal cars. Products features such as fuel consumption, reliability, comfort and performance that provide value and upgraded functionality plays a big role in purchase decision-making. Derived from the the product features leads to brand trust and inspired the decision to buy from the same brand. Affordable and acceptable ownership costs and the consequence purchase power plays important factors in influencing car purchase decision. Higher income people favouring more expensive cars and the subsequent high ownership costs. At the same time, social needs during the pandemic situation has prohibited individuals from close contacts and gatherings that further requires the consumers to purchase cars. COVID-19 pandemic that was known to be airborne and transmittable diseases had truly fundamental impact on purchase decision especially for car buyers. The research examine the correlation of consumer behaviour towards purchase decision specifically in Malaysian context. This research

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_128

can be used as guidance to map the consumer behavior while providing future and practical insights for carmakers towards reviving car industry that being one of the hardest hit by the pandemic.

Keywords Purchase decision · Consumer behaviour · Product features · Ownership costs · Social needs · Purchasing power · Brand trust

1 Introduction

The automobile industry was coping with the downshift in the global demand during COVID-19 pandemic. The lock-down scenarios during this pandemic led to widespread customer confidence loss which had a significant impact on the profitability and revenue of the automakers. The automobile companies in Malaysia also were forced to stop their investment in their continued operations. Funding in the R&D process was also ceased for which technological advancement had not taken place in this industry during this period. The global car sales declined by 20% in 2020 which is depicted in the below figure. In 2018, the automotive industry grew by 3% which was down to 1.9% in 2019 (Deshpande, 2019) (Fig. 1).

Different liquidity issues were also faced by the suppliers and therefore the condition of the market deteriorated. In 2018, around 25 M commercial cars and 70 M cars were made. The wellbeing of the citizens of the world, as well as the economy of the country, is dependent partially on these vehicles. The enhanced rate of car manufacturers increases the rate of employment of a country (Kim, 2020). Due to health concerns, the mobility behaviour changed as most of the customers worked from home while others stayed away from public transportation.

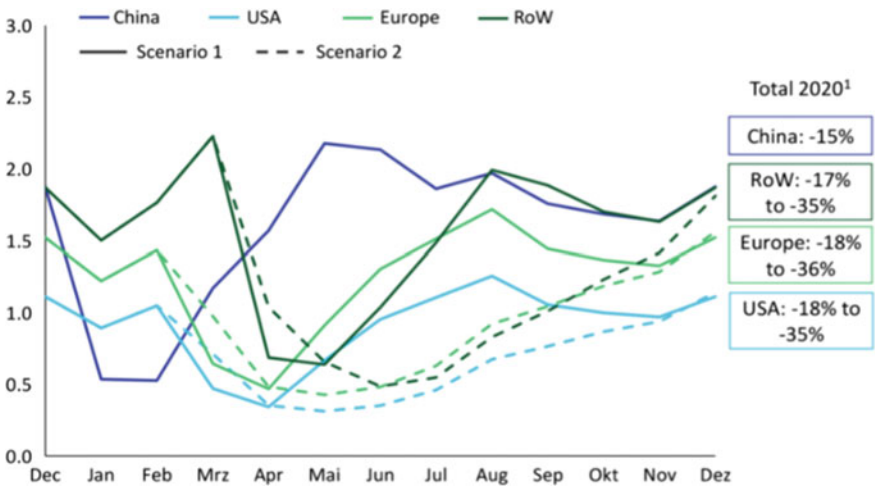

Fig. 1 COVID 19 impact on a global car sale, 2020. *Source* Deshpande (2019)

The car purchasing decisions of the customers are dependent on different factors such as product features, social needs, ownership costs, and brand trust. However, there was a severe and swift impact of COVID 19 on the global automobile industry in 2020. Hence, the large-scale manufacturing process was interrupted all across the world during the outbreak of this pandemic. Consumer behaviour during the pandemic includes lowering the perceived infection threat (Shakibaei et al., 2021). There were also some external factors such as unexpected health emergencies and internal factors such as personal life and attitude that changed the purchasing behaviour of consumers during the pandemic.

2 Background Study

The annual sales of the global automobile industry are predicted to reach 110 M units by 2022. In order to meet the short-term threats, the manufacturer may have to dedicate CAPEX (capital expenditure). It has been seen that the car purchasing rate is higher among the high-income households in Malaysia. As per the view of previous study on current situation, most of the customers are interested in contactless service (Tardivo et al., 2020) (Fig. 2).

The sales of the automobile industry fall to 70 M units in 2021 and it is expected that this industry will grow by 9 Trillion dollars by 2030.

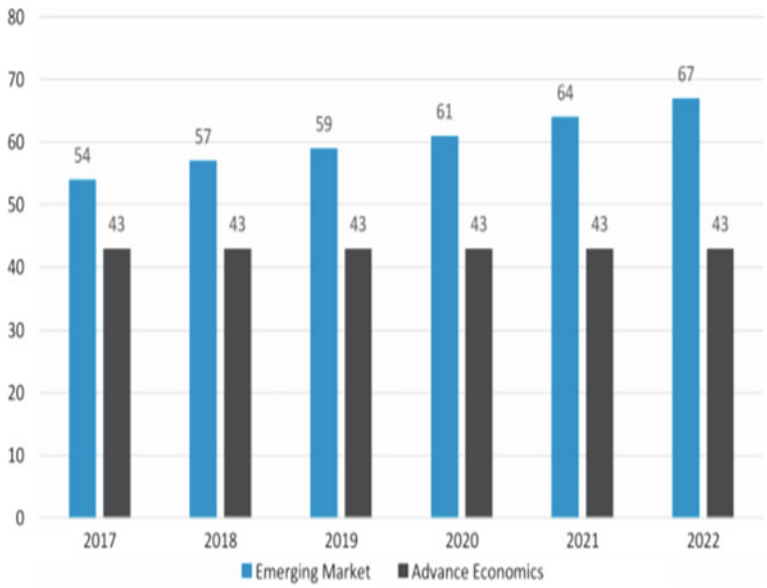

Fig. 2 Sales of global vehicle, medium-term forecast (in million). *Source* Wagner (2021)

Table 1 New motor vehicle registration in Asia before the pandemic

In 2018	In 2017
45,726	46,025
% change 18/17	−0.6
% share 2018	47.0

Source Deshpande (2019)

Number of New Motor Vehicle Registration in Asia Before the Pandemic

In Table 1, the numbers of registered cars in Asia before the pandemic have been highlighted.

Background of Car Purchase Decision During COVID 19

In order to manage the challenging and serious situation, the government of Malaysia had taken different stimulus policies and among them, the most important policy was tax reduction in vehicle purchase (Kumar, 2020).

Figure 3 depicts that the car purchasing decisions of the customers are dependent on need recognition, information search, and alternative evaluation. The purchasing decision during the pandemic was declined as there was a low need for automobiles in the lockdown scenario (Esposti et al., 2021).

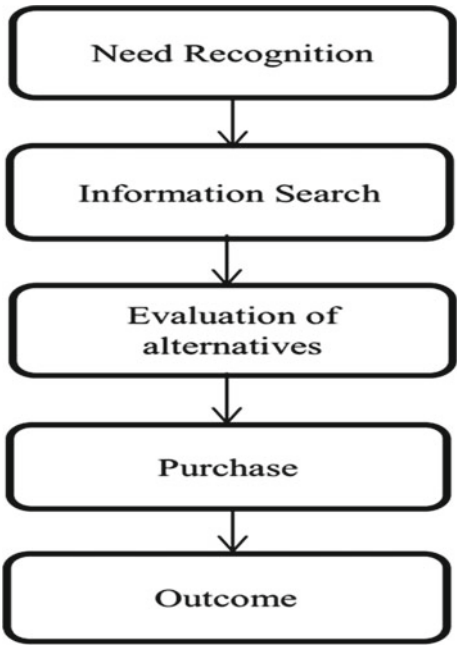

Fig. 3 Consumer decision-making model. *Source* Kumar (2020)

Background of the Car Purchasing Decision Influencing Factors

Consumer behaviour during the pandemic includes lowering the perceived infection threat (Shakibaei et al., 2021). There were also some external factors such as unexpected health emergencies and internal factors such as personal life and attitude that changed the purchasing behaviour of consumers during the pandemic.

As for **product features**, during the pandemic most of the consumers were seeking safety features such as remote vehicle diagnostic and emergency assistance in their vehicles (Awad-Núñez et al., 2021). In the meantime, consumers are attracted by the free and extra product benefits or features of the companies. The features that are in demand in the automobile industry include the availability of spare parts, technical support, and warranty (Bhaduri et al., 2020).

The car **ownership cost** notably includes a monthly repayment but also includes different factors such as petrol cost, road tax, and premium for car insurance (Sheth, 2020). According to recent research, the high car price had affected the purchasing decision of the customers (Garaus & Garaus, 2021).

It has been seen that the major **social need** during the pandemic was social distancing. Different social issues were raised during the pandemic such as lower Gross Domestic Product (GDP) rate as well as the unemployment rate (Abdullah et al., 2020). It has also been analysed that the rate of social media purchasing was increased during the pandemic. The Malaysia's GDP rate in 2020 was −5.59% while the unemployment rate was 4.55% in Malaysia as per (O'Neill, 2021). Thus, it is clear that this lower GDP and high unemployment rate significantly affected the car purchasing power of the customers.

It has been seen that during the COVID-19 pandemic, safety and health became the paramount concern. Thus, changes in the economic condition changed consumer's **purchasing power**. The rate of employees laid-off increased during the pandemic which has affected the purchasing power of the customers (Leow & Husin, 2015). It has been seen that the average income of the Malaysian people during this pandemic was RM 2093. The annual household income of this country fell by 15.5% in the year 2020 (Jabatan Perangkaan Malaysia, 2021). The customers had tuned concisely during the pandemic, it affected their purchasing power (Raza & Masmoudi, 2020).

The availability of service centres, waiting period, brand value as well as dealership reputation are considered as **brand trust** influencing factors (Leow & Husin, 2015). It has been seen that due to improved brand trust in Malaysia, the national carmaker Proton's sales volume was 108.52 thousand units in 2020 despite the outbreak of the COVID-19 pandemic (Müller, 2021).

Since the COVID-19 pandemic, there are little guarantee that factors such as product features, ownership cost, social need, purchasing power and brand trust will continue to have the same influence on car buyers behavior to purchase cars. Previous COVID-19 study focused on travel behavior and preference mode of transport such as Awad-Núñez et al. (2021), Bhaduri et al. (2020), Garaus and Garaus (2021), Kumar (2020), Shakibaei et al. (2021) and Abdullah et al. (2020). Meanwhile, previous researchers like Leow and Husin (2015) had emphasized on car buyers purchase decision during non pandemic period. However, there are some researchers such as

Raza and Masmoudi (2020) who focused on the scope of Bahrain's consumer vehicle purchase decision-making during COVID-19. There is a limited study conducted for car buyers in Malaysia especially during the pandemic on the dimension of consumer behaviour that contributes to purchase decision.

3 Literature Review

3.1 Purchase Decision

Purchase decision in context to availing cars among the Malaysian citizens is largely dependent upon numerous factors for instance Product Features (PF), Ownership Costs (OC), Social Needs (SN), Purchasing Power (PP) and Brand Trust (BT). Dependent variables are the effect whose values change according to the independent variables. In the current study, the purchase decision is the dependent variable as the consumer's intention to avail car depends upon the attractive products features and its utility. Advanced technological usage, multiple utility features, reasonable product prices create a positive impression among the consumers to opt for the products (Shetty, 2021). While on the other hand, decrease purchase power, limited product features, lack of brand trust and lower social requirements creates a negative attitude and belief among the consumers that further prevent them from availing products of their preferences.

3.2 Consumer Behaviour

The decision and action process of the customers for purchasing services and goods for personal consumption is referred to as consumer behavior. There are four types of consumer behaviors such as variety seeking, habitual buying, reducing the dissonance, and a complex behavior. During COVID-19, the behavior of the customers was associated with lowering perceived infection threat. On the other hand, unexpected health emergencies and personal life and attitude changed consumer behavior during the outbreak of the pandemic.

3.2.1 Product Features

Product features are the characteristic attributes that compel consumers to opt for the products of their choice. Product features include artistic components like shape, colour, space, the tone that successfully captures consumer attention (Kowang et al., 2018). Functional aspects, quality and experience associated with the products play a dominating role in determining the purchase behaviour of the consumers (Altaf &

Hashim, 2016). In context to car purchase behaviour of the consumers, product features for instance shape, color, tone of the car adds up to the aesthetic component of the products that result in shaping consumer purchase intention (Alganad et al., 2021). Furthermore, the functional attributes of the products indicate the benefits associated with utilizing a product. The pandemic situation has created trouble for consumers who preferably used public transport for movement. However, increased functionality, comfortable seating arrangements enhance positive experiences of the consumers that further positively enhances consumers buying decisions.

3.2.2 Ownership Costs

Ownership costs highlight the financial resource investment involved in product purchase, operational management and maintenance of the products. In context to availing cars, consumers are required to pay a heavy price for not only availing the products during the initial period but also involves financial investment including the present and future costs while posing the assets. Personal cars require maintenance and servicing costs that help consumers enjoy the services that further adds value to the prices they pay for availing the act of their preferences. As stated by Wadud (2017), often increased ownership costs prevent consumers from availing of cars and thus negatively affecting the purchase decisions of the consumers.

3.2.3 Social Needs

Human beings are social organisms and individuals who affect their purchase behaviour and decisions surround them. Maslow's hierarchical needs highlight that possession of products serve as a basis for the fulfilment of an individual's psychological, safety, belongingness, self-esteem and self-actualisation needs. Since individuals are constantly interacting with other social individuals they prefer to exhibit and perform actions that result in increasing their chances of being socially acceptable (Akar & Dalgic, 2018). However, the current pandemic situation has prohibited individuals from social gatherings evening in public transport that further compels them to adopt alternative strategies to resolve transport difficulties. Social requirements thus positively tend to increase the purchase of cars by consumers.

3.2.4 Purchasing Power

The purchasing power (PP) of the consumer is the ability of the consumer to avail the product of their choices. As opined by Jayaraman et al. (2018), the economy of the country affects the purchasing power of the consumers. Decrease in products prices, increased GDP, decreased inflation rate and increased average annual income of the consumer's results in increased PP of the consumers. Increased PP thus allows consumers to avail products according to their preferences. Thus, interrelationship

between PP and Purchase decision indicate higher PP contribute towards positive purchase intension and vice-versa while availing car by consumers.

3.2.5 Brand Trust

In the current competitive ambience, it is essential for the organization to implement innovative strategies to capture consumer attention that further contribute towards providing competitive benefits and increase brand trust. Brand trust (BT) ensures that consumers prefer the selected brand to all other competitors. Product and service quality, experience, perceived risk, brand reputation and security showcased by brand regulate consumer loyalty (Adzharuddin et al., 2017). Superior quality experiences, customer services, enhanced safety and security of the consumers delivered by the brands help consumers had better relate with the organizational goals. Thus, in context to the purchase decision of consumers, BT plays a dominating role in determining consumer preferences while opting for products from particular brands.

3.3 Interrelationship Between Product Features and Purchase Decision

Marketing activities from selling, distribution of goods and promotional strategies cluster around the products being sold by the organization. Product features include discrete areas of upgraded functionality that enhance consumer's value. Both tangible and intangible attributes associated with the products contribute towards determining the purchase behaviour of the consumers (Sahoo & Satpathy, 2020) (Fig. 4).

In the context of purchasing a car, consumers prioritize both the tangible and intangible aspects of the cars. For instance, consumers prefer to look at car size, colour, and material composition while availing a car of their choice. While on the other hand, intangible attributes associated with a car include exchange value, utility benefits. According to the recent report on the sales volume of Proton, the company has reported selling 108,524 cars in 2020 which is comparatively much more than 100,183 cars sold in 2019 (Lim, 2021). The car purchase intention of consumer's increases when the product satisfies their needs and are capable of mitigating the travel difficulties faced by the consumer's number during the pandemic (Peterson & Simkins, 2019). Enhanced utility values constitute increased consumer purchase intention. In context to the increased sales volume of the automobile industries in Malaysia thus sheds light upon the differential product features and highlights the innovative product attributes that are capable of differentiating products from other competitors.

H1: Product features possess a direct positive influence on purchase decision.

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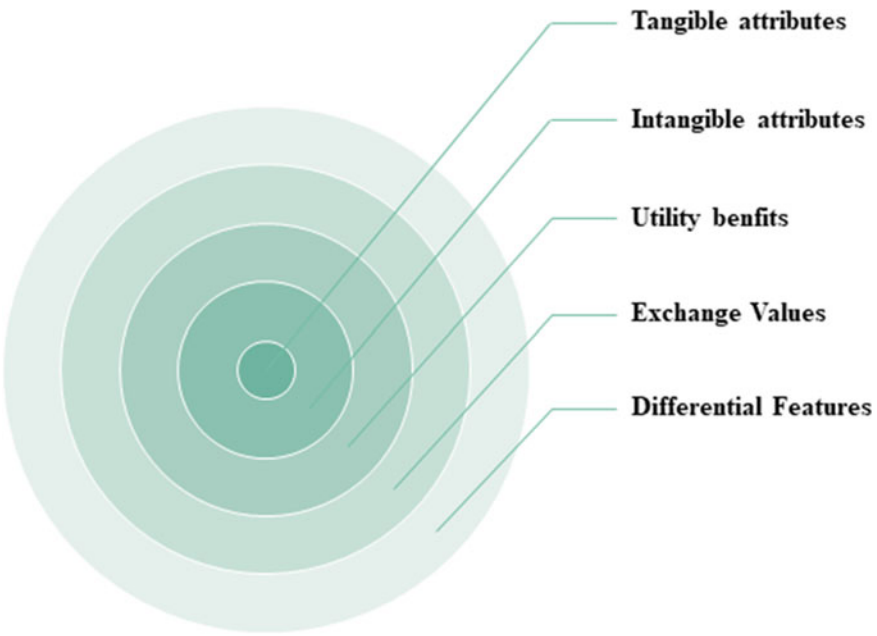

Fig. 4 Products features that affect consumer purchase decisions. *Source* Sahoo and Satpathy (2020)

3.3.1 Interrelationship Between Ownership Costs and Purchase Decision

Ownership cost highlights not only the short-term purchase cost associated with the product but also the long-term operating and maintenance cost associated with the products (Fig. 5).

Ownership cost highlights several factors from petrol price to depreciation cost, road tax and car insurance that must be considered by the consumer while availing the cars. As stated by Havidz and Mahaputra (2020), ownership cost estimation helps individuals obtain a comprehensive view of the products and the values associated with them. Consideration of the maintenance, petrol price, depreciation costs helps individuals to wisely undertake purchase decisions (Fig. 6).

According to the report on the ownership cost associated with the reputed automobile cars, the ownership cost of Perodua Myvi, Perodua Aruz reported to be RM 1579 and RM 2013 respectively. While ownership cost for Honda HRV and Proton is reported to be RM 2658 and RM 2842 respectively (Hasan, 2021). Increased ownership costs create a negative impression in the consumer's mind and adversely affect the purchase decision of the consumers.

H2: Ownership costs possess a direct negative influence on purchase decision.

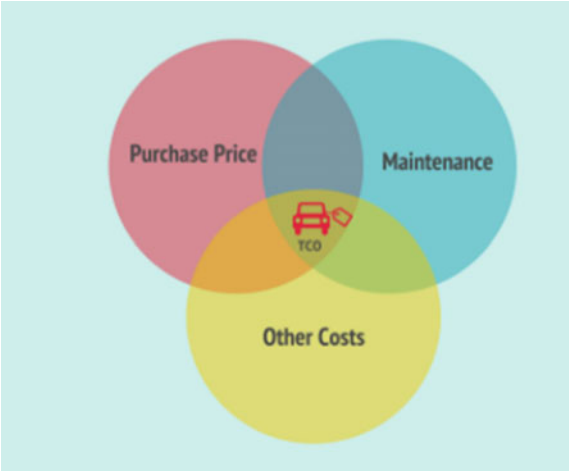

Fig. 5 Ownership costs and purchase decision. *Source* Havidz and Mahaputra (2020)

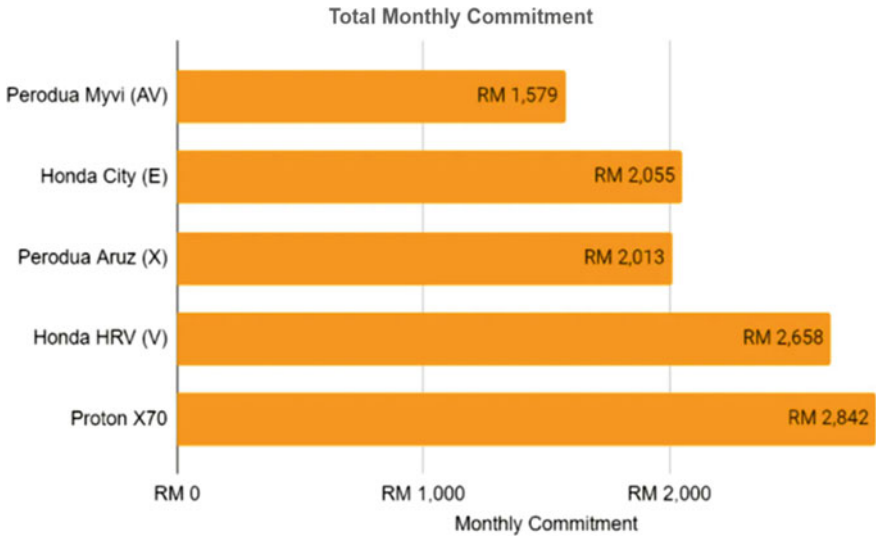

Fig. 6 Ownership costs and purchase decision. *Source* Hasan (2021)

3.3.2 Interrelationship Between Social Needs and Purchase Decision

Social needs highlight the exhibition of activities by the individuals that increase his or her chances of social acceptance. Lifestyle, income status, family requirements are the crucial factors that determine the purchase intention of the consumers. Product pricing strategy as determined by the marketers depends upon the current market trends, advanced technology usage and innovative product features (Dong

et al., 2017). Implementation of the latest technology to enhance product attributes results in higher car prices. The income status of an individual plays a significant role in determining whether the individual can afford a first hand or second-hand car. According to the report on the average monthly salary of Malaysian citizens, the average monthly salary is reported to be 3.2 thousand Malaysian ringgit in 2019 (Jabatan Perangkaan Malaysia, 2021). Furthermore, the salary of the individual may vary depending upon the educational qualification and nature of employment. Individuals with higher disposable income opt for first-hand cars with unique features in comparison to the individuals with lower disposable income who opt for second-hand cars (Du et al., 2018). While on the other hand, households with large families tend to purchase large cars that are spacious and are able to provide comfort to the users (Ali et al., 2019).

H3: Social needs possess a direct positive influence on purchase decision.

3.3.3 Interrelationship Between Purchasing Power and Purchase Decision

Purchasing power indicates the financial resources invested by the consumer while opting for the product of their preferences. The purchasing power of the consumer depends upon the country's GDP, inflation rate, and economic growth (Jannah & Supadmi, 2021). Enhanced economic growth of the country indicates increased GDP and employment within the country. Increased GDP further contributes towards the increased annual income of the citizens of the country thereby strengthening the purchase decisions. The inflation rate on the other hand has an influential role in determining the product price. High inflation rate results in a higher price of cars that can be afforded only by individuals with higher income. However, the reduced inflation rate positively guides consumer purchase intention of the consumers.

H4: Purchasing power possess a direct positive influence on purchase decision.

3.3.4 Interrelationship Between Brand Trust and Purchase Decision

Organizational reputation and culture are significant in the current competitive business ambience that facilitates enhanced corporate revenue. As opined by Novansa and Ali (2017), consumer loyalty is directly interlinked with brand trust. Brand trust allows consumers to avail products from the reputed brands dispensing upon the product and service quality. Provision of superior quality products along with reasonable prices, consideration of consumer safety and security issues plays a significant role in strengthening brand awareness and reputation. Sustainable aspects of products, superior quality consumer experiences and immediately addressing consumer issues generates a positive attitude among the consumer towards the brands thereby contributing towards enhanced purchase decisions among the consumers.

H5: Brand trust possess a direct positive influence on purchase decision.

4 Theoretical Framework

The consumer decision process is the broad aspect that encompasses multiple activities from increased consumer awareness to need recognition, accumulation of information to solve needs, evaluation of alternative options and finally undertaking purchase decisions. ***EKB model*** highlights the procedures and the factors that shape the consumer purchase behaviours and determine the process followed by the consumers while choosing among the alternatives.

The EKB (Engell–Kollat–Blackwell) model includes information inputs, information processing, decision process and external variables that affect their purchase decisions (Osei & Abenyin, 2016). In context to car purchase behaviours among Malaysian consumers, unique marketing strategies implemented by the marketers creates an urge within the consumers to avail themselves the luxurious cars at a reasonable price. Information processing further highlights memory retention of the attractive product features that further instigate the purchase decision of the consumers (Leljak & Dobrinic, 2019). Furthermore, the necessity of availing cars during pandemic situations would relieve consumers from the difficulties that they face in public transport thereby compelling them to meet their needs by availing personal vehicles that serve to resolve their problem at the earliest. However, evaluation of alternative products is largely influenced by several external variables like consumer attitudes, beliefs, lifestyle, cultural norms, family and group influences.

Consumer purchase intentions are not stable rather it changes according to the market demands, products feature and quality. The current pandemic situation has affected almost every aspect of human lives. Prohibition and limitation on public transportation have resulted in increased trouble for the office goers and has adversely affected their daily lives. Safety protocols in context to social distancing have compelled individuals to prevent social gatherings that threaten social life due to the spread of disease.

The current study has focused on highlighting the increased car purchase in Malaysia among consumers. According to the recent report on sales volume and market growth by Perodua, one of the leading automobile industries in Malaysia, market share has been reported to increase from 39.8% in 2019 to 41.6% in 2020 (Lim, 2021). Increased car sales by the automobile company in Malaysia during the pandemic highlights several factors that played a significant role in regulating the purchase decisions of the consumers. The research framework thus has been formulated keeping in mind the dimension of consumer behavior such as PF, OC, SN, PP and BT that regulates and relation that further affect purchase decisions (Fig. 7).

5 Research Methodology

Quantitative research design has been opted by their searcher to discover the thinking, acting or feeling process of the people in a particular way. It involves huge sample

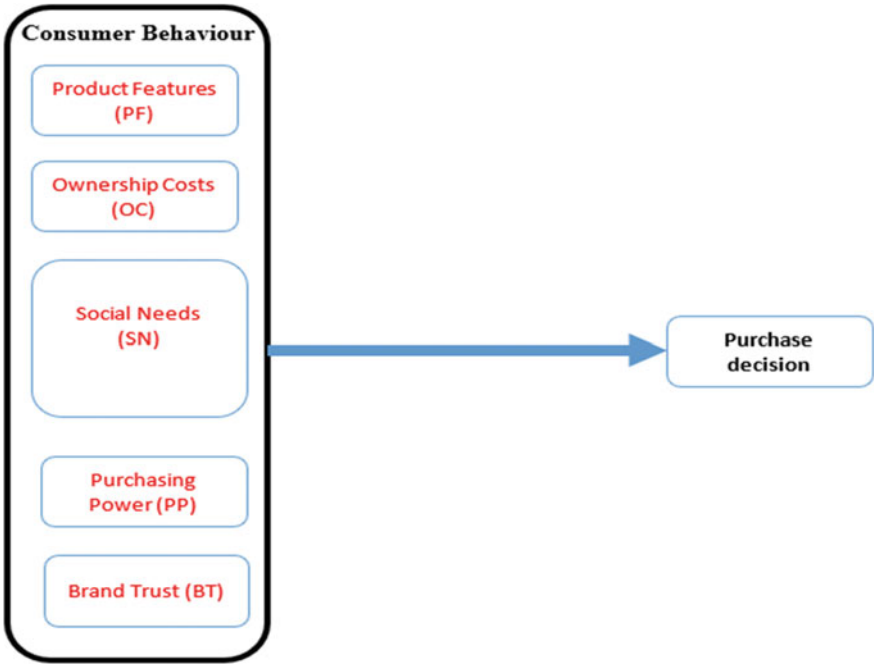

Fig. 7 Research framework (*Source* Created by the researcher)

sizes and concentrates on response quality. There are four main types of quantitative research design and these are correlation, causal-comparative, descriptive and experimental. Among them, the descriptive research design technique was followed by the researcher to conduct a true experiment. A ***descriptive research design*** enables a researcher to investigate the causal relationship among the variables (Rutberg & Bouikidis, 2018). Therefore, the casual relationship among the dependent variable purchasing decision of the customers and independent variable customers behaviours and Covid-19 has been analysed by the researcher appropriately. The major purpose of this research design is to generate knowledge and creating understanding regarding the social world.

The use of a scientific inquiry is dependent on the observed data for examining questions regarding the sample population (Chih-Pei & Chang, 2017). In this research design, the researcher used the statistical method to analyse the hypotheses. Large subject numbers have been included in this research design that helped the researcher to generate appropriate hypotheses, theories, and models. Imperial data have been collected by the researcher which increased the experimental control, variable manipulation, and improved the measurement methods. In this way, the researcher has gained the benefit to follow a structured method for this research. The outcome of this research is highly reliable and reusable. In this process, the research has gained different numerical outcomes (Rutberg & Bouikidis, 2018).

The researcher followed the simple random sampling technique in this research where a random portion of the entire population was selected. In ***simple random sampling***, the probability of being chosen by each of the members remains equal (Sharma, 2017). The first step of the random sampling technique is defining the population. The population that was selected in this study was ***potential car buyers in the Johor Bahru area***. In this way, the researcher collected information from all men and women of the selected sample. The second step of this research was deciding the sample size. The ***sample size*** of this research was ***80*** due to time constraints. The size of the sample was decided by using confidence level and standard deviation. The third stage was randomly selecting the samples. In order to complete this stage, the ***random numbered method*** was chosen by the researcher. The population subset was randomly picked by the use of a RAND (random number function) in MS Excel for generating random numbers. The last stage of this sampling technique was collecting accurate data from the sample. Dropped out questions by the respondents increases the biases in findings (Etikan & Bala, 2017). Thus, the researcher selected the respondents who completed the whole survey successfully.

All of the data gathered were verified and analyze through Statistical Package for Social Science (SPSS—Ver.22) tools, therefore the outcome such as correlation coefficient, reliability and validity, and multiple-regression are accurate (Ticehurst & Veal, 2000).

6 Conclusion

In the context of the purchase decision of the consumer opting for cars during Covid-19 highlights several factors that play a significant role in regulating consumer purchase decisions. The study has successfully shed light on the varied factors ranging from Product features, Ownership costs, Social needs, Purchasing power and Brand trust that has a certain impact on the buyer's purchase decisions. Product features from both tangible, intangible attributes along with other factors help consumers to select the products of their preferences. However, individual income along with the purchasing power of the customer is essential in determining the purchase intention of the consumer. Consumers with higher income are more likely to purchase expensive cars in comparison to the ones with lower income who would prefer a second-hand car or public transport. Hence, this study is one that focuses on the car buyers in Malaysia and the significant factors that impacted their purchase decisions at the time of the Coronavirus (COVID-19) outbreak.

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Environmental Forces Influencing Perceived Acceptance of COVID-19 Vaccination: Social Responsibility as a Moderating Role

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Abstract The main objective of this research is to investigate the environmental forces influencing perceived acceptance of COVID-19 vaccination. Also, to investigate the moderating role of social Responsibility. The research independent variables consist of environmental forces (economic, political/legal, and social), the dependent variable is represented by perceived acceptance of COVID-19 vaccination. A quantitative method was using cross-sectional online research questionnaire to collect the primary data. A sample of (N = 2084) respondents who follow the social media platforms were selected. Therefore, a stratified simple random method was used in this research. The result shows a positive influence of political/legal and social on perceived acceptance of COVID-19 vaccination. In contrast, there is no influence of economic factor on perceived acceptance of COVID-19 vaccination. The research results are beneficial for formulating an effective polices and strategies for vaccination in Jordanian health market. The current research result recommends that Jordanian FDA and MOH, nationally authorized of COVID-19 vaccines, employer

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_129

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powerful force and recommendations, friends and family, and positive words of mouth can all play an important role for vaccination acceptance and increase the percentages of Jordanian citizen to be vaccinated which was consistent with previous studies. The current research reflected the positive role of political/legal and social factors on perceived acceptance of COVID-19 vaccination among Jordanian people. Also, the research outcomes are beneficial for formulating an effective polices and strategies for vaccination in Jordanian health market.

Keywords Environmental forces · Economic · Political/Legal · Social · Acceptance of COVID-19 vaccination: social responsibility · Jordan

1 Introduction

Since the emergent of corona virus from China in March 2020 which it quickly spread out into the rest of the world. The World Health Organization has declared that corona virus as pandemic disease. Corona virus has become a sever public health issue (Alameeri et al., 2021; Al-Dmour et al., 2020). Therefore, governments around the world have changed their health strategies to prevent further spread of COVID-19 (Ahmad et al., 2021; Akour et al., 2021). Governments put stricter rules and guidelines such as social distance, avoiding social gatherings, testing every suspected case, staying home, university and school closures, workplace distancing, and lockdowns were all introduced to reduce the impact of corona virus disease. Just like the rest of the world, Jordan has been suffering from the effect of COVID-19 on all aspect of life. Therefore, the Jordanian government took an extraordinary measures and strict emergency law to fight COVID-19 pandemic disease. Governments and their top medical labs, they all were racing to develop and deploy safe and effective vaccines. Vaccines work by training and preparing the body's natural defences—the immune system—to recognize and fight off the viruses and bacteria they target. After vaccination, if the body is later exposed to those disease-causing germs, the body is immediately ready to destroy them, preventing illness (The World Health Organization 2021). Different types of vaccines have been rolled out in many countries. Vaccines are a critical new tool in the battle against COVID-19 and it is hugely encouraging to see so many vaccines proving successful and going into development. Working as quickly as they can, scientists from across the world are collaborating and innovating to bring people tests, treatments, and vaccines that will collectively save lives and end COVID-19 pandemic disease (Abbas et al., 2020; Al Khasawneh et al., 2021a). One year has been passed since the beginning of the global pandemic of COVID-19 (Alshurideh et al., 2021; Nuseir et al., 2021). Today we have several vaccines to choose from to protect ourselves and prevent the further spread of this virus and its newer variations. Research on vaccine production has begun in early 2020 (Jordan et al., 2020). Also, governments around the world have been occupied with vaccinating its populations (Leo et al., 2021; Shah et al., 2021; Taryam et al., 2020). Kwok et al. (2020) Suggest a "a critical (minimum) herd-immunity threshold

of 67% to reach safety and go back to living previously accustomed to lifestyles. Also, (Lazarus et al., 2021) attempted a global survey of potential acceptance of a COVID-19 vaccine to measure the likelihood of the public taking the vaccine and whether employer recommendation to take the vaccine would affect this likelihood (Cobb et al., 2021). They state that 71.5% of its participants reported they would take the vaccine while 61.4% said they would take it if their employer requested them to take it (Lazarus et al., 2021).

Vaccine acceptance is a troubling area affected by several factors, such as cultural, trust, fear of future side-effects. Also, scientist plan to measure the effect of vaccine on economic, political/legal, social factors, and all aspect of human lives. Lazarus et al. (2021) Found that greater trust in government significantly affected the acceptance rate positively, as did employer advice. They measured a sample from 19 countries which comprised about 55% of the global population, consisting of 53.5% women, and 63.3% earned more than $32 per day, and 36.3% had a university degree, and 62.4% were between 25 and 54 years old, which is a similar age representation of the majority of Jordan's population. They found a 90% acceptance rate in China, compared to 55% in Russia. In this study, we plan to measure the acceptance rate in Jordan (Gates, 2020). Higher level of income and education populations were found to have more positive acceptance of the vaccine, while higher trust in government information also showed more positive acceptance as long as the information provided was detailed and clear, such as "explaining how vaccines work, as well as how they are developed, from recruitment to regulatory approval based on safety and efficacy. Effective campaigns should also aim to carefully explain a vaccine's level of effectiveness, the time needed for protection (with multiple doses, if required) and the importance of population-wide coverage to achieve public immunity" (Aljumah et al., 2021; Lazarus et al., 2021; Wise et al., 2020). Furthermore**,** Asian countries had the highest acceptance rate, while middle-income countries "such as Brazil, India and South Africa" also showed significantly high acceptance rates (Lazarus et al., 2021).

Another study conducted on COVID-19 vaccine acceptance in China by Wang et al. (2020) conducted an online survey among 2058 Chinese adults where a majority of 91.3% confirmed they would take the vaccine once available, where the questionnaire attempted to measure sociodemographic characteristics including education, employment status and income, in addition to risk perception and the impact of contractive COVID-19 on their lives, work and studies, as well as vaccination history of the seasonal flu-shot who are considered a higher risk group of infection. The study result revealed that 52% of the targeted population wanted to get the COVID-19 vaccine; however, the rest of the sample which is 48% would like to delay the vaccination until the side effect is safe (Huang et al., 2020).

Wang et al. (2020) also found that being male and married increased the possibility of taking the vaccine since they are perceived as higher risk group and are more likely to follow doctor recommendations, yet less likely to follow employer recommendations to take the vaccine. According to the study result were done by Kreps et al. (2020) showed that 79% of the sample selected a vaccine that has high efficiency and longer duration of protection.

Opel et al. (2020) Mentioned in their study to increase the acceptability of COVID-19 Vaccine, the US official needs to share and transparence data and they should increase informed consent considerations. In addition, Opel et al. (2020) urges frequent and visible communication with public in order to build trust and achieve confidence in COVID-19 Vaccines (Abuhashesh et al., 2021). Graffigna et al. (2020) studied the main factors that affect citizen decision making for taking or not taking COVID-19 vaccine. The study focused on perceived effectiveness, safety and side-effect concerns, vaccine benefits, and where the vaccine was originated. Furthermore, they research studied social factors such as recommendations from family members and health authorities. In addition, individuals also care about vaccination cost, vaccine availability, and accessibility.

A study was done by Tam et al. (2020), measure the differences between older adults and young adults, where older people has been prioritized for corona virus prevention and treatment. On the other hand, young people were less likely to comply with prevention practices and social distance (Fisher et al., 2020). A recent study in the US were done by Reiter et al. (2020) had mentioned the most factors that increase COVID-19 vaccine acceptance. The most important vaccine attribute for selection was increased efficacy, followed by a longer duration of protection and a significantly lower incidence of major adverse events. Also, US citizen were more likely to select a vaccine has an endorsement from the US centers. However, US participants were less likely to select a vaccine was developed outside of the United State, specially from China. Another key finding that US citizens have higher vaccine acceptability rates when endorsed by public health agencies. However, US citizens did not trust politicians' endorsements for public health issues. Opel et al. (2020) urge caution against interpreting the results as further evidence of vaccine hesitancy spreading, although they note that "vaccine hesitancy and a reluctance to accept a COVID-19 vaccine are not completely distinct" therefore, public health authorities should communicate and engage with public in order to encourage people to accept and trust COVID-19 vaccine acceptance (Czeisler et al., 2020; Dror et al., 2020).

In order for Jordanian health official to develop effective corona virus vaccine promotion strategies, it is very important for official to understand what factors would contribute to vaccine acceptance and what factors would result in vaccine rejection. For this reason, Jordanian health official needs to communicate the benefit of vaccines, safety concerns, side effects, vaccine accessibility, and availability in order to change the Jordanian citizens' belief and attitude toward the acceptance of COVID-19 vaccine (Irwin et al., 2017). This study aimed to investigate the factors (economic, political/legal, and social) influencing on perceived acceptance of COVID-19 vaccination among Jordanian people with the moderating role of social responsibility. The research outcomes might be beneficial for health decision makers to establish a concrete strategy for vaccination against epidemics and pandemics (Rosenstock, 1974).

2 Methods

2.1 Research Design, Sample

To test for causal relationships between the research variables, we adopted a quantitative method using cross-sectional online research questionnaire to collect the primary data. A sample of (N = 2084) respondents who follow the social media platforms were selected. Therefore, a stratified simple random method was used in this research.

2.2 Measures

The self-administered questionnaire was designed based on previous studies (Lazarus et al., 2021; Opel et al., 2020; Wang et al., 2020) to examine the influence of environmental forces on perceived acceptance of COVID-19 Vaccination. The research questionnaire consists of (1) socio-demographic characteristics, such as age, gender, occupation, working in medical field, income, and health condition; (2) environmental forces (economic, political/legal, and social) as an independent variable; (3) social responsibility as a moderating variable; (4) perceived acceptance of COVID-19 Vaccination as dependent variable. Both English and Arabic statements were presented in the questionnaire. The questionnaire contained five-point Likert scales 1 = strongly disagree and 5 strongly agree. The original sources of the main scale items are presented in Table 1.

3 Results

3.1 Demographic Examination

Despite the fact that the demographical age and gender factors are of minimal impact on the retrieved data, the researchers managed to collect data from different age groups, both gender, occupation, income level, working in the medical field industry, and health conditions. Table 2 describes the demographic distribution of the research sample.

Table 1 Construct operationalization

Item No	Construct	Source
Perceived economic effect on vaccine acceptance		
PE1	Vaccine price can affect my decision towards being vaccinated	Adopted from Lazarus et al. (2021), Wang et al. (2020)
PE2	The economies of taking the vaccine such as (distance to vaccination sites, waiting time etc.) plays a role in my decision to be vaccinated	
PE3	Costs associated with taking the vaccine influence my decision to take it	
Perceived political and legal effect on vaccine acceptance		
PPL1	FDA & MOH authorization is key to accept taking the vaccine	Adopted from Lazarus et al. (2021), Wang et al. (2020), Opel et al. (2020)
PPL2	Nationally authorized vaccines can provide me with reassurances to accept the vaccine	
PPL3	Employer powerful force and recommendation is an important factor in vaccination acceptance	
PPL4	National laws for vaccinations can play an important role in accepting the vaccine	
Perceived social effect on vaccine acceptance		
PS1	My friends and family play a role in accepting the vaccine	Adopted from Lazarus et al. (2021), Opel et al. (2020)
PS2	I am likely to be influenced by my friends and family's decision to take the vaccine	
PS3	Word of mouth from my social circle may influence my acceptance of the vaccine	
Social responsibility		
SR	Taking the COVID-19 vaccine is part of my social responsibility	Authors
Perceived acceptance of COVID-19 vaccination		

(continued)

3.2 Descriptive Analysis

The following test results are presented as shown in Table 3; descriptive analysis for the answers of all environmental forces dimensions (economic, political/legal, and social) and social responsibility as a moderating factor, and perceived acceptance of COVID-19 vaccination (PAV) as a dependent factor.

The descriptive statistics offered in Table 3 pointed to a positive and negative disposition towards the variables measured.

Table 1 (continued)

Item No	Construct	Source
PAV	How likely will you take a COVID-19 vaccine when it is available? The question was rated using a five-point Likert scale (1 = definitely not take it, 2 = not likely to take it, 3 = I don't know, 4 = likely to take it, and 5 = definitely take it) Based on their responses, participants were divided into three groups including (1) Refusal group, (participants with answers of '1' or '2'); (2) Hesitancy group (participants with answers of '3'); (3) Acceptance group (participants with answers of '4' or '5')	Authors

3.3 Reliability Analysis

Reliability analysis is defined by Wilkinson (1999), p. 598 as a psychometric property of a particular sample's response to a measure monitored under specific scenarios and conditions. Particularly, the recommended scale shall exhibit high extents of internal consistency in reference to Cronbach alpha or composite reliability (Hair et al., 2012). In fact, the accepted and agreed upon percentage of Cronbach alpha is (70%), whilst the composite reliability's advised percentage is (80%) (Streiner, 2003).

The current research shows that Cronbach alpha exceeded (70%) in the five scales variables (e.g., 0.792–0.831), and the composite reliability of each scale was above (80%) as of (0.827–0.907). Moreover, it has been suggested that convergent validity is related to the level of harmony and agreement between a conceptual theory such as the latent construct and its monitoring tool that may be referred to a number of elements that measure the implicit construct) (Hair et al., 2012). The aforementioned validity is reflected through the AVE (average variance extracted) which indicates the shared average variance between a variable and the items related to it.

Table 4 presents the AVE of the five variables which is more than the recommended threshold of (50%). More specifically, the AVE of the five variables was in the range of (0.593–0.636), indicating that the items of each scale are indeed related. Depending on the outcomes of these tests, the instrument of the study is useful, which allows the academics to manage statistical analysis.

Table 2 Demographic characteristics

		Frequency	Percentage
Age	18–30	1110	53.3
	31–40	456	21.9
	41–50	312	15.0
	51–60	150	7.2
	61 +	56	2.7
	Total	2084	100
Gender	Female	1182	56.7
	Male	902	43.3
	Total	2084	100
Occupation	Students	780	37.4
	Unemployed	260	12.5
	Retired	132	6.3
	Part-time employee	114	5.5
	Full-time employee	798	38.3
	Total	2084	100
Working in medical field	No	1818	87.2
	Yes	266	12.8
	Total	2084	100
Income	300 JD and less	822	39.4
	301–700	504	24.2
	701–1100	296	14.2
	1101–1500	162	7.8
	More than 1500	300	14.4
	Total	2084	100
Health condition	No history of known medical conditions	1736	83.3
	I have history with certain medical conditions	256	12.3
	Prefer not to say	92	4.4
	Total	2084	100

Table 3 Descriptive analysis table

Items	Numbers	Mean	SD
Economic	2084	2.21	0.921
Political/legal	2084	3.91	0.897
Social	2084	3.27	0.915
Social responsibility	2084	3.72	0.926
PAV	2084	3.52	0.895

Table 4 Convergent validity and internal consistency of survey

Variables	Cronbach alpha (α)	AVE	CR
Economic	0.831	0.608	0.892
Political/legal	0.825	0.636	0.907
Social	0.810	0.613	0.866
Social responsibility	0.799	0.610	0.827
PAV	0.792	0.593	0.834

Table 5 Discriminant validity

Variables	E	PL	S	SR	PAV
Economic	**0.821**				
Political/legal	0.622	**0.812**			
Social	0.190	0.604	**0.806**		
Social responsibility	0.353	0.459	0.312	**0.801**	
PAV	0.366	0.314	0.290	0.310	**0.813**

3.4 Convergent and Discriminant Validity

The assessment of Discriminant Validity, as suggested by Fornell and Larcker (1981) is possible when comparing and contrasting the correlation between the coefficients of the construct along with the square roots of AVE, which ought to be higher than that of the other constructs, paving the way for the output results of the study model to be disseminated in the study population.

As stated in Table 5, the correlation between the coefficients of the construct is less than the square roots of AVE, reflecting its loadings to their latent construct to be higher than that of other constructs. As a consequence, the discriminant validity of the research model is proven to be satisfactory, enabling the possibility of reflecting the results derived from the study model on the study community. Herein, the discriminant validity is not an issue of concern.

3.5 Structural Model and Hypotheses Testing

With the intention of determining the possibility of accepting the research hypotheses, multiple linear regression tests were set. Besides, significance testing has been undertaken to detect if the hypotheses are accepted or not with a threshold percentage limit not to be exceeding 0.05 to facilitate the substitution of hypotheses and refuse the void ones, particularly due to the fact that the research applied the coefficient of determination to demonstrate the impact of the dependent variable on each responding independent one. In reference to the conceptual theory that declares the value of

Table 6 The results of the first hypothesis

Direct effect	Coefficient (β)	T-value	P-value $P \leq 0.05$	R^2	Decision
Economic → PAV	0.014	1.013	P = 0.925	0.392	Rejected
Political/Legal → PAV	0.342	4.321	P = 0.001		Accept
Social → PAV	0.332	4.278	P = 0.000		Accept
Environmental Forces → PAV	SigF = 0.001		F-Value = 12.119		Accept

R^2: 0.51 = Strong; 0.330 = Moderate; 0.20 = Weak
Effect size: 0.02 = Small effect; 0.15 = Moderate effect; 0.35 = Substantial effect

significance to be less than 0.05 ($p < 0.05$) for the hypotheses 'H' to be considered accepted, the statistical study applied various linear regressions tests that are presented in Table 6 for the first hypothesis.

Table 6 demonstrates the outcomes of multiple regressions of environmental forces dimensions and the way it can affect *perceived acceptance of COVID-19 vaccination* as follows:

H1: Environmental forces factors and social have a significant impact on perceived acceptance of COVID-19 vaccination at sig. level ≤ 0.05.

The results of the analysis support this hypothesis (Sig. F = 0.001; F = 12.119). Thus, the hypothesis is accepted. In other words, it is confirmed that if Jordanian Government apply theses dimensions, the Jordanian community will accept to take this vaccine.

H1a: Economic factors have a significant impact on perceived acceptance of COVID-19 vaccination at sig. level ≤ 0.05.

The results of the analysis do not support this hypothesis (Sig < 0.05, = 0.925; T-value = 1.013; β Coefficient = 0.014). Therefore, the hypothesis is rejected affirming the negative impact economic factor on the *perceived acceptance of COVID-19 vaccination.*

H1b: Political/legal factors have a significant impact on perceived acceptance of COVID-19 vaccination at sig. level ≤ 0.05.

The results of the analysis support this hypothesis (Sig < 0.05, = 0.001; T-value = 4.321; β Coefficient = 0.342). Accordingly, the hypothesis is accepted indicating that if political and legal factors are applied, then *perceived acceptance of COVID-19 vaccination* will increase.

H1c: Social factors have a significant impact on perceived acceptance of COVID-19 vaccination at sig. level ≤ 0.05.

The results of the analysis support this hypothesis (Sig < 0.05, = 0.000; T-value = 4.278; Coefficient = 0.332). Therefore, the hypothesis is accepted and this demonstrates that if social factor is applied, the *perceived acceptance of COVID-19 vaccination* will increase.

H2: social responsibility would moderate the relationship between environmental forces factors and PAV at sig. level ≤ 0.05.

Moreover, to test for H2 concerning social responsibility moderation between environmental forces factors and perceived acceptance of COVID-19 vaccination, (Hayes, 2017) process macro model was used. The product indicator method was used as it employs all the indicators of the latent predictor and moderator and all the pair combinations possible which serve the interaction term in the structural model. As seen in Table 3 there is a significant influence of social responsibility on the path between environmental forces factors and perceived acceptance of COVID-19 vaccination.

The results show that the significance level p- value is 0.011 ($P \leq 0.05$). Thus, the alternative hypothesis test is statistically accepted (supported).

Table 3 also shows that the R^2 rate is (0.421) which points to the precision in *perceived acceptance of COVID-19 vaccination* that relies on environmental forces dimensions (economic, political/ legal, and social), this value is moderated and reliable in the process of interpretation and prediction (Table 7, Fig. 1).

Table 7 The results of the second hypothesis

Indirect effect	Estimated coefficients	S.E	Std. Est. Coef	F2	P-Value	R^2	Hypothesis
Interaction term (Environmental forces factors * social responsibility) PVA	0.120	0.054	0.096	Substantial effect	0.011	0.421	Accepted

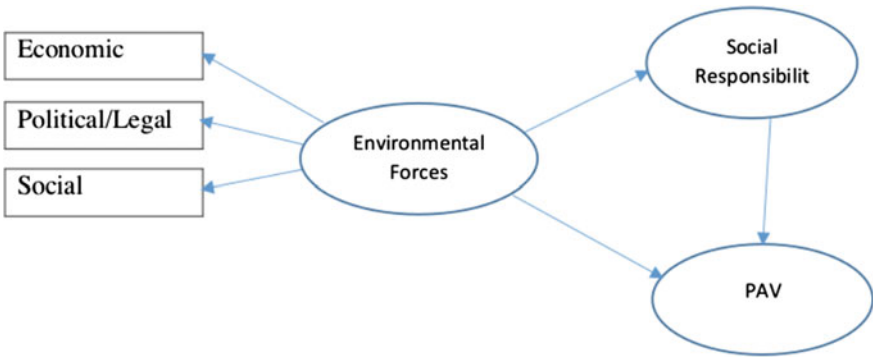

Fig. 1 Structural model

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4 Discussions

The current study measures the acceptance rate of Jordanian citizen that would be vaccinated during the COVID-19 pandemic disease. The research stated high acceptance of COVID-19 vaccination among the Jordanian people during the pandemic disease. The study analysis showed that Jordanian with higher level of income and education were found to have more positive acceptance of COVID-19 vaccines. Moreover, the study results illustrate that people show more positive acceptance, when the government provide a trusted information such as the true effectiveness of the vaccine, the origin of the vaccine, the side effect of the vaccine, and how the vaccine works. Two out of three environmental forces affect perceived acceptance of COVID-19 vaccination namely political/legal and social factors. Whereas, economic factor shown no affect perceived acceptance of COVID-19 vaccination. The result of the study analysis supports the main hypothesis (H1), thus, H1 was accepted. Therefore, the study reported high acceptance of COVID-19 vaccination among Jordanian population if some conditions were applied. However, the study result did not support (H1a) hypothesis. The analysis showed that economic factors such as vaccine price, distance to vaccination sites, waiting time, and other related cost did not have an impact on Jordanian citizen to take the vaccine. Thus, the hypothesis (H1a) is rejected. The study analysis showed that political and legal factors have significant impact on vaccine acceptance. Therefore, the hypothesis (H1b) was accepted. Thus; national authorized, FDA & MOH authorization, and Employer powerful force play an important role for COVID-19 vaccine acceptance. The study analysis also showed that social factors have positive impact on citizen acceptance of COVID-19 vaccination. Consequently, family and friends can play a positive role in decision making to accept the vaccine. Moreover, positive word of mouth about the vaccination can influence people to accept the vaccine (Al Khasawneh et al., 2021b). Therefore, the study results accepted (H1c) hypothesis. In addition, the study analysis support (H2) hypothesis. Jordanian citizens believe that taking COVID-19 vaccine is part of their social responsibility in order to protect their community, to go back to their previous life, and to improve their economic conditions. For this reason, the current research confirmed the positive role of political/legal, economic and social factors moderated by social responsibility factors on perceived acceptance of COVID-19 vaccination among Jordanian people. In order for Jordanian health official to develop effective corona virus vaccine promotion strategies, it is very important for official to understand what factors would contribute to vaccine acceptance and what factors would result in vaccine rejection. For this reason, Jordanian health official needs to communicate the benefit of vaccines, safety concerns, side effects, vaccine accessibility, and availability in order to change the Jordanian citizens' belief and attitude toward the acceptance of COVID-19 vaccine (Gadoth et al., 2020).

The current study result recommends that FDA & MOH, nationally authorized of COVID-19 vaccines, employer powerful force and recommendations, friends and family, and positive words of mouth can all play an important role for vaccination acceptance and increase the percentages of Jordanian citizen to be vaccinated which

was consistent with previous studies. Moreover, after the high number of deaths among the Jordanian citizen and the hard conditions that people suffer during corona virus, majority of Jordanian citizen changed their attitude toward COVID-19 vaccination. Thus, high percentage of acceptance and positive attitude toward corona virus vaccination reflected the Jordanian people strong demand for COVID-19 vaccination and the high recognition of the importance of vaccines in order to control the pandemics disease (Tian et al., 2020). Furthermore, people started to think seriously about the pros and cons of the vaccinations (Karafillakis & Larson, 2017). Jordanian residents felt the negative impact on their daily life, work, income, and the disease severity on their health and their beloved one. Hence, the majority of the Jordanian citizens thought that COVID-19 vaccination is an effective way to control and prevent corona virus from spreading (Leung et al., 2020). The positive behaviors and attitude toward vaccine, explain the high percentage of vaccine acceptance (Kraemer et al., 2020). Jordanian adults and married citizens perceived the benefit from corona virus vaccine compared with the risk associated on their health and life style (Bone et al., 2010).

5 Conclusions

The current research reflected the positive role of political/legal and social factors on perceived acceptance of COVID-19 vaccination among Jordanian people. The study findings represented a good start in the process of achieving the coverage rate required to ensure herd immunity among the Jordanian residents. Also, the research results are beneficial for formulating an effective polices and strategies for vaccination in Jordanian health market. Firstly, Activate the role of Jordanian FDA & MOH authorization as a critical factor of accept taking the vaccine. Besides, the Jordanian national authorization and laws regarding motivated Jordanian people to accept the vaccination. Secondly, trigger the role of social medial and word of mouth of social circle may influence acceptance of the vaccine. Lastly, the Jordanian government and health bodies should be improving the accessibility of vaccination in terms of the economies of taking the vaccine such as (distance to vaccination sites, waiting time etc.) because of it plays a role in the decision to take the vaccine. Jordanian health official showed design an immunization programs that can remove barriers that hinder people from getting vaccination. As well, health official should communicate with people about any public concern such as vaccine safety (Cheney & John, 2013). Public concern about vaccine safety has frequently been reported as the major obstacle to vaccination decision-making. Some of the Jordanian residents delay their vaccinations until safety of COVID-19 vaccine is confirmed. Therefore, Jordanian health officials need to use all the available tools to persuade people to take the vaccine and to stop the hesitations. Some of the reasons that explain people delay and hesitation are the concerned that the vaccine still under development, no real data and information about vaccine negative side effect and safety. In addition, people concern about the different news and reports about the safety of the vaccine.

Also, negative testimonies from doctors and pharmaceuticals would lower the confidence among public concerns. Besides, our study showed that people who valued convenience tend to delay their vaccination. Thus, Jordanian health officials need to monitor reports that concern vaccine safety with the publics on regular basis. Furthermore, officials can increase doctor and pharmaceutical testimonies regarding safety and future concerns.

To be proactive and respond successfully for any possible epidemic or pandemics in the future, health governing bodies in Jordan (MOH, Royal Medical Services, and Private Sectors) should take in to consideration training programs in terms of vaccination and continuous education for health service providers in general and health providers who working in Epidemiology field in particular.

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Ebb and Flow Theory in Tourism, Hospitality, and Event Management

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Abstract This study aims to track the events that affected tourism in Jordan and presents the evolution of tourist inflows and outflows linked to these events. Accordingly, the Ebb and Flow Theory in the service industry is created and discussed. Many terminologies were used in the tourism industry to clarify the incoming and outgoing tourism movement, such as "peak period and recession period", "high–shoulder and low-shoulder", "high-season and low-season", and others. This study sheds light on a new insight that accurately and clearly describes what is happening in the tourism, hospitality, and events industry. It describes the period of prosperity and development in the tourism movement as the Flow, and the period of stagnation and confinement in the global tourist movement as the Ebb. Also, the fluctuation between these two periods is called solstice time. Understanding these periods helps organizations develop their strategies, achieve the desired benefit, improve and innovate in providing optimal service.

Keywords Strategic planning · Ebb and flow theory · Destination · Tourism · Hospitality · Events · Jordan

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_130

1 Introduction

The economy of many countries depends on a specific industry, but the tourism and hospitality industry are considered one of the basic industries in all countries of the world, regardless if this country is rich in its natural resources or has a scarcity of natural or human resources (Abu Zayyad et al., 2020; Abuhashesh et al., 2019; Alaali et al., 2021; Alananzeh, 2017; Mahmoud et al., 2021). It is undoubtedly one of the largest, most growing, and prosperous industries in the global economy, and it clearly competes with the petroleum or technological industries for some countries (Khan et al., 2020). It is expected that it will maintain its position in the future. Tourism is not a goal but a means to contribute to comprehensive national development, and it is by its nature a multi-lateral and interdependent industry (Mihalic, 2014). Nevertheless, the tourism industry is highly sensitive to various internal and external shocks and crises, such as economic fluctuations, natural disasters such as earthquakes, earthquakes, fires, health epidemics, terrorism, and interstate conflicts (Al-Dmour et al., 2017; Jiang et al., 2019; Sönmez et al., 1999).

It is no longer seen as a secondary sector in the economies of countries, due to its importance in GDP and its role in adjusting the balance of payments, which is usually done through the availability of foreign currencies that enables the country to import its basic needs (Manzoor et al., 2019). This industry witness's rapid growth and development in many countries that have done well to preserve the stability of this sector and immunize it against various natural, political, economic, and health shocks and crises (Breier et al., 2021; Chiu et al., 2019; Obeidat et al., 2017, 2019). Therefore, maintaining a stable and accelerated growth in the tourism sector is not a result of luck and chance in the countries that are successful in tourism, but rather the product of policies, strategies, and plans that are thoughtful and pre-placed within what is called tourism crisis management (Perles-Ribes et al., 2016), which examines the theories, variables, contributors and affected parties (Alshraideh et al., 2017), and procedures that can be taken to avoid or reduce the damage resulting from various crises and disasters before, during and after the crisis for the quick return, recovery, and advancement of tourism after any emergency (Al-Dmour et al., 2021; Alrowwad et al., 2020; Alzoubi et al., 2020, 2022; Masadeh et al., 2019; Masa'deh et al., 2013, 2019; Mashaqi et al., 2020; Tarhini et al., 2015).

That crisis management lies through protecting and preserving the various sectors of this industry and achieving the optimal use of the country's resources during the peak season, or the so-called high-season, as the tourist destination is witnessing a tremendous influx in the number of tourists, which will reflect positively on the prosperity and economic recovery of that tourist destination and at the same time cause some damage or negative effects to the tourist destination (Adamou & Clerides, 2009). And the safe speed of managing crises and risks to which the tourism industry may be exposed in a tourist country or countries of the whole world if that crisis is global as it is now in the Coronavirus pandemic (Covid-19) (Breier et al., 2021). Sometimes we need to manage the regular crisis, which is meant by the natural expectation of a decrease in the number of tourists resulting from natural causes such

as high or low temperatures that affect the attractiveness of the tourist destination or what is sometimes called a low-season, which is the decline in the number of tourists to that destination (Aqqad et al., 2019; Breier et al., 2021; Rossi, 2012; Sausmarez, 2007; Uysal & Kılıç, 2020). The impact of crises is also severe on hotel employees, as many companies are laying off a number of employees due to their economic conditions, and this affects the loyalty of employees as well as the orientation of the workforce towards the hospitality sector (Hunaiti et al., 2009; Masa'deh et al., 2017a, 2017b).

2 Ebb and Flow Theory

Ebb and flow (tides) are very long waves that move across the oceans under the influence of the moon and the sun, and when these waves advance towards the coast they appear as a regular rise and fall of sea water, and the reason for these waves is the earth's rotation around itself, and the moon's rotation around the earth. This is as a result of the gravitational pull of the moon water in the oceans towards it, and the tide occurs in the face of the moon, and the opposite side to it (National Ocean Service, 2021).

In other words, Flow is a temporary, gradual rise in the water level of an ocean or sea surface. Ebb is a temporary, gradual decrease in the water level of the surface of the ocean or the sea. The fisherman understands (sectors of the tourism and hospitality industry) from these fish (the tourism movement), they leave their dens (tourists' origin) to eat at the time of the flow (prosperity, prosperity, and peace) and return again at the time of the ebb (disasters and crises). This means that stakeholders of the tourism and hospitality industry must know how to make the most of the flow period and how to deal with strategic planning to manage crises and disasters in the ebb.

In the tourism and hospitality industry, tourism companies rely in particular on the theory of Ebb and Flow in their investments and prosperity. Where the flow indicates the influx of tourists, and therefore a large tourism activity that requires tourism movement and congestion in the means of tourist transport. From here, the tourism companies begin to provide competitive services and coordination with the providers of tourism and travel offices and other tourism companies. The flow is considered joy and prosperity season for tourist transport companies. But every flow must be followed any an ebb, which is a decrease in the number of tourists, or the so-called low season, and here companies must follow strategic plans to deal with the ebb. However, the Corona pandemic period was a long ebb, which required the government to intervene to save the transport sector until the flow came.

The main causes of the ebb in tourist transportation are world wars and the flu epidemic, starting from a year 1918 where there is a comparison between the results of the current pandemic and those disasters in a wide range of consequences. Unfortunately, we can expect other major disturbances in the future (Hendrickson & Rilett, 2020; Jiang et al., 2017).

The tourism industry has gone through many crises over the past 20 years (Ebb). In 2003 during the SARS epidemic, the events of September 11, 2001, and the global economic and financial crisis in 2009. But after these crises, the tourism and hospitality industry will return to its previous state, and perhaps much better, as it flourishes and revives strongly and quickly (Flow).

3 Importance of Ebb and Flow

Ebb and Flow movements are of great importance as they work to cleanse the seas and oceans of all impurities, as well as cleanse estuaries and ports of sediments, as they help ships to enter ports that are located in shallow areas. But the high flow may pose a threat to navigation, especially in the straits.

The phenomenon of Ebb and Flow is one of the natural phenomena that occur in all the seas of the world, and that the ratio of high flow and low ebb varies from the North Pole to the Antarctic through the equator, in some areas of the world it reaches more than 200 cm, and in other areas it does not exceed 30 cm. In other words, in some places, the difference between ebb and flow is not very large, and in others, the difference is huge.

Since ancient times, people have been alerted to the importance of the power of the ebb and flow and have used this in managing their mills to grind grain. The ruins of these mills are still found on the shores of Brittany, in northern France, since the twelfth century AD. The idea by which these mills operate is very simple and is summarized in reserving flow water in a reservoir during high tide, and when the reservoir is filled with water, special gates are closed so that the water level in the reservoir is higher than the sea level when the water begins to recede.

In the tourism, hospitality, and events sector, this happens exactly, as the tourist destination witnesses an active tourism movement, and then this movement begins to decline and shrink. That is, the tourist destinations, in general, go through an ebb and flow time. In a recession period, establishments, tourist destinations, and service facilities can take advantage of this period for strategic planning, training, reconstruction, renewal, and general development in preparation for the period of the return of tourism.

As for the flow time, tourism establishments, service facilities, and tourist destinations must focus on Total Quality Management (TQM) in order to maintain competitiveness, market share, and pay attention to customer satisfaction. The success of tourism destinations and service facilities depends on the ability to strategic planning, which is considered a comprehensive process through which future actions and goals are defined and what steps are necessary to achieve these developmental and competitive goals.

Strategic planning needs to address a number of things during the ebb time for the development of the tourist destination, such as the environment and the impact of tourism on it during the flow time, improving the traffic-related infrastructure, especially in major city centers, and addressing the causes of pressure in some tourist

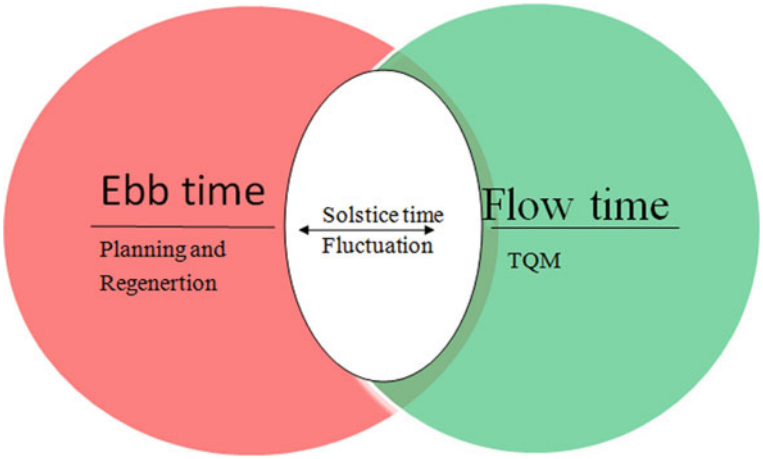

Fig. 1 Ebb and flow theory and its implementation (*Source* Prepared by the researchers)

areas. It makes strategic planning for the flow of tourists easier and does not affect the living conditions of the local population. Strategic planning also helps in maintaining the various service facilities and exploiting them in a healthy way, which can be the main driving force behind the revitalization of tourist destinations and their economic growth, especially during the transition process that destinations go through in the process of transition from ebb time to flow time (Jurdana, 2018) (Fig. 1).

On the other hand, tourism destinations and service establishments such as hotels and restaurants are responsible for total quality management during flow time, which means paying attention to all details and the involvement of all employees in achieving quality required to maintain the level of excellence in providing an ideal competitive service (Mok et al., 2013).

This is achieved by evaluating the policy and procedures followed to develop and implement comprehensive quality requirements and guarantee them that help the company in attracting a large number of tourists regardless of the reasons for travel, whether for business or leisure purposes. The expectations of tourists are high and they demand a certain level of quality; customers are generally willing to pay more for quality.

4 Tourism Industry in Jordan as a Case Study

Jordan is located in the west of the Asian continent, in the heart of the Middle East, and is bordered to the north by Syria, to the east by Iraq and Saudi Arabia, to the south by Saudi Arabia, and to the west by Occupied Palestine, and it has one seaport, which is the Gulf of Aqaba on the Red Sea. Jordan has an area of 89,342 km^2, and its most important natural resources are phosphates, potash, and shale oil. It is

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characterized by a moderate Mediterranean climate in summer and cold in winter (Alananzeh et al., 2018a, 2018b; Al-Dhoun, 2019; Alsarayreh et al., 2010).

Tourism is one of the main industries in Jordan, as the contribution of this industry reached an average of 8.10% in the Jordanian GDP during the period (1980–2014). Jordan relies on it mainly in adjusting its balance of payments (Abuamoud et al., 2019; Al-Dhoun, 2019; Bader et al., 2016). The tourism industry in Jordan has been affected by many political and security crises at the global, regional, or local levels, such as the second Gulf War in 1990, the second Palestinian uprising in 2000, the events of September 11th related to the bombing of the World Trade Center in 2001, the third Gulf War in 2003, the SARS epidemic IN 2003, Amman hotel bombings in 2005, the global economic and financial crisis in 2009, and the events of the Arab Spring for the period (2011–2014), the pandemic of Covid-19 (Al-Dhoun, 2019; Al-Shorman et al., 2016; Kreishan, 2014).

Table 1 clearly shows the great variation in the numbers of arrivals to Jordan, as the number increases (flow) in cases of peace and decreases (ebb) significantly in cases of crisis whether local, regional, or global. We also note through the statistics that the events that take place in Egypt affect quickly the tourism movement in Jordan for several reasons, including the proximity of Jordan to Egypt and the joint cooperation between the tourism offices in the two countries, as well as the common cultural, religious and civilization factors between Jordan and Egypt.

Figure 2 shows the impact of events and crises on the tourist movement (ebb and flow) coming to Jordan. We notice that there are ebb movements that have negatively affected the tourism movement in Jordan, for example the events of the end of the year 2000, The Second Palestinian Intifada (9-28-2000), which affected tourist areas in the West, but their impact was positive on Jordan. However, some crises and events in the other part of the ball affect positively the tourist, as the flow of tourists begins to the opposite part of the globe (flow movement). The best example of this is the events of September 11, which affected tourist areas in the West, but their impact was positive on Jordan, where the number of arrivals to Jordan increased due to this, and this was confirmed by the study of Al-Shorman et al. (2016), who indicated that Jordan has become a safe haven for tourists in these global crises. This increase was also accompanied by the visit of Pope Paul II to the baptism site, which reflected positively on the movement of tourists to the region (flow).

However, the occurrence of local and regional crises has a negative impact on the flow of tourism to Jordan (the movement of islands), such as the events of the Arab Spring. It leads to the influx of tourists to the other side of the globe (tidal movement).

5 Conclusion

Since the dawn of time, tourist destinations have been affected by the movement of ebb and flow in the movement of tourists. As the movement of flow meant prosperity, development, and economic and social returns for the tourist destination. And the

Table 1 Major events that impacted tourism industry in Jordan

Year	Number of arrivals	The major event	Its impact
1990	0,577.446	Peace and stability	
1991	0,439.481	The second Gulf war (1990-191)	Decrease
1992	0,699.262	Peace and stability	Increase
1993	0,774.871	Peace and stability	Increase
1994	0,857.61	Peace and stability	Increase
1995	1.074.548	Jordan-Israel peace treaty (26-10-1994)	Increase
1996	3, 164,000	Peace and stability	Increase
1997	3,068,000	Local protests linked to soaring bread prices (18-8-1996)	Decrease
1998	3,484,000	The establishment of the Jordan Tourism Board	Increase
1999	3,231,000	Peace and stability	Decrease
2000	2,700,000	The Second Palestinian Intifada (28-9-2000)	Decrease
2001	3,034,000	September 11th (11-9-2001) The visit of Pope Paul II to the Baptism Site	Increase
2002	4,677,000	Peace and stability	Increase
2003	4,600,000	The third Gulf war	Increase
2004	5,587,000	Peace and stability	Increase
2005	5,817,000	Amman Hotel bombing	Increase
2006	6,573,000	War on Hezbollah	Increase
2007	6,529,000	Peace and stability	Decrease
2008	7,100,000	Petra became one of the Seven Wonders of the World in 2007	Increase
2009	7,058,000	The war on Gaza, 27-12-2008	Decrease
2010	8,078,000	The visit of Pope Pope Benedict II to the Baptism Site in 2009	Increase
2011	6,813,000	Civil war in Syria Arab Spring 2010-2011	Decrease
2012	6,314,000	Impact of Arab Spring	Decrease
2013	5,389,000	Egypt-The dismissal of Egyptian President Mohamed Morsi The organization of the Islamic state- Daesh (ISIS)	Decrease
2014	5,327,000	The war on Gaza (2014)	Decrease
2015	4,809,000	The war on Daesh (ISIS)	Decrease
2016	4,236,000	Brussels attacks	Decrease
2017	4,565,000	Peace and stability	Increase
2018	4,922,000	Peace and stability	Increase
2019	5,361,000	Peace and stability	Increase
2020	1, 800,000	Covid-19	Decrease

Sources (1) The World Bank (The World Bank, 2021), (2) Central Bank of Jordan, annual reports (Central Bank of Jordan, 2021)

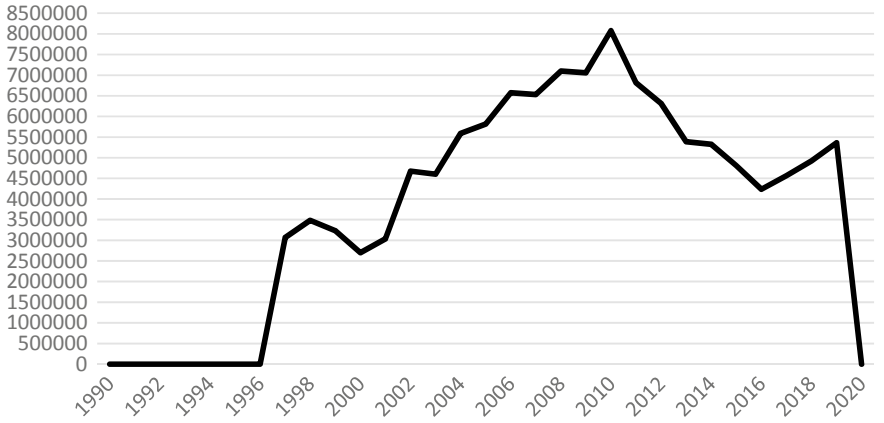

Fig. 2 International inbound tourists (overnight visitors)

flow of traffic may sometimes be above the capacity of the tourist destination, causing the loss of opportunities and negative impacts on the tourist destination and the host community. This is what strongly imposes on those tourist destinations that witness a tremendous turnout of tourists to plan to make the most of this flow movement and reduce the allowance for loss and negative impact.

On the other hand, some tourism destinations are facing at the same time a movement of decline and retreat in the tourism movement (ebb), and this is reflected negatively on the operational process of the facilities and the tourism projects in that tourist destination. Here, too, those countries must follow strategies and contingency plans to manage these crises in order to save the tourist season during the recession.

In the end, ebb and flow times have both benefits and downsides. However, tourist destinations, including tourism facilities and projects, must plan to take advantages of the flow time through the optimal absorption of the increase in the number of tourists, the optimal use of existing resources and resources, and the preservation of the permanence of those resources, focusing on reputation and service quality, and also following the method used in the shores of Brittany, in northern France, in storing water in the flow time to operate the mills in the ebbing time. Alternatively, those tourist destinations that suffer from stagnation in the tourism movement due to seasonality or local, regional, or global events and crises must reduce the risks and save the tourist season by following a developmental strategy and taking advantage of the stock of the peak period (flow time), as well as following the policy of beach cities, which adopts a policy cleaning, arranging, rebuilding and improving the beaches during the ebbing time, because that helps well. Those tourist destinations can follow this policy and strategy in re-developing, cleaning, and expanding the tourist sites in preparation for the flow time.

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The Impact of Marketing, Technology and Security Orientations on Customer Orientation: A Case Study in Jordan

Omar Jawabreh and Ra'ed Masa'deh

Abstract The aims of this study are multifold: to explore the functionality of hotel websites by performing a content review and to evaluate customer opinions on the value of the design of hotel websites. To perform the study, hotel websites were used to include numerical and visual information. Information providers are assessed by an evaluation of their particular and comprehensive expertise measurements. The research is based on two significant aspects: a report on all 37 five-star hotels in Jordan that examines their website layout in terms of population, and a survey of 100 hotel clients to determine how clients interpret hotel websites. This planned study is the first of its sort, seeking to determine an appraisal method for all hotel measurements provided by hotel websites. The findings are as follows: When value T = 7.519 reflects the results of the independent variable (marketing orientation), the coefficient of simple linear regression has statistical significance (Customer Orientation). The fact that "Aqaba Zone Advertising and Customer Orientation Classified Hotels have a statistically significant influence on their categorization" is acknowledged, as "Aqaba Zone Advertising and Customer Orientation Classified Hotels have a substantial impact on the coefficient of simple linear regression equation (0.605)". As a result, hotel management may utilize a particular predictive evaluation model to analyze the websites of their hotels from a two-sided perspective: the management team and the consumers. This analysis brings together claims from both perspectives for the first time (hotel managers and clients).

Keywords Marketing orientation · Technology orientation · Security orientation · Customer orientation · Jordan

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_131

1 Introduction

The increasing usage of digital technology is providing a solid path for the expansion of the market for services in sectors such as tourism and hospitality, among others (Ahmad et al., 2021; Lee et al., 2022a, 2022b; Tariq et al., 2022b). Use of Information and Communication Technology (ICT) refers to the use of computers, the internet, mobile phones, and other digital devices in the course of corporate activities have drawn attention to the fact that technological advancements have really done their best to define the preferences and prospects of current and future visitors and travelers. Technology, in the form of computers and connected technologies, has made it easier for companies to gather, process, distribute, and store data at a quicker, more accurate, and error-free pace than ever before (Alshurideh, 2022; Alzoubi et al., 2022; Ansah et al., 2012). By modernizing their various company operations, the Indian tourist and hospitality sector has quickly adopted the use of this technology to provide better and more sophisticated services, as well as to explore new commercial possibilities by expanding their existing operations.

Due to the ever-changing marketplace and the rapid growth of information technology, a variety of customers are booking their travel facilities electronically, such as travel, hotel and car rental (Abu Zayyad et al., 2020; Bhuiyan et al., 2020; Chia et al., 2021; Shannak et al., 2010; Tariq et al., 2022a; Yang et al., 2014). In addition, according to a survey of 249 casual travelers (Toh et al., 2011), 80% of travelers searched for hotel information via blogs, with more than half making their bookings via hotel websites or third-party websites. As a result, the Internet plays a crucial function in customer behavior, with more than 50% of the sales of global hotel chains credited to online marketing networks in 2010 (Pan et al., 2013).

This study continues to extend the body of expertise and experience in the online review management assessment of the contents of the hotel website. There have been several academic reports focused on the travel and hospitality industry, which can be classified as either observational or theoretical analysis (Abujamous et al., 2018; Alaali et al., 2021; Daniel et al., 2016; Mahmoud et al., 2021). In the minds of customers, the Internet provides the right to access a hotel directly, without regional or time constraints, to request information and to make transactions. Managers in control of promotions and sales for hotels see lower delivery prices, increased profits, and a greater market share as being great outcomes from hotel websites (Abuhashesh et al., 2021; Al Kurdi & Alshurideh, 2021; Alshurideh et al., 2017; Masa'deh et al., 2018; O'Connor, 2003; Panagopoulos et al., 2014).

An important and well-known marketing resource for hotels is the hotel website (Kim et al., 2017). The job of designing and maintaining websites of the highest standard have been a crucial element in holding the company running. Unfavorable internet experience will limit online purchases, remove future buyers and have a detrimental impact on corporate credit. The analysis described the climate and process efficiency as the two key factors for determining the quality of the electronic services offered by hotel websites. The hotel website acts as a direct connection between the hotel and its guests to meet the needs of the customer (Hahn et al., 2017;

Meng et al., 2020). These days, passengers will use online booking applications to easily pick their lodging. The hotel website presented visitors with high-quality, but cost-effective, details while lowering costs and saving time.

For the evaluation of websites based on studying targets, a number of researchers have identified many variables. For the usage of the fuzzy Delphi screening method, the new study utilizes the present Delphi system, which is composed of many separate variables (Law & Wong, 2010). They explored the effect of blogging on tourism management as a result of their usage of analysis strategies used in other studies. The research discusses a variety of frameworks for website decision-making, including multi-criteria decision-making (MCDM). Promethee is considered to be the most effective promethee model owing to its capacity to accommodate a broad variety of quantitative and qualitative factors, as well as to rank various choices.

There has been a substantial growth in the amount of ways for large hotel chains to capture new market share through their use of the internet in the hospitality industry. As the Internet is still a required networking tool, hotels can make use of it to aid with their marketing (Abuhashesh et al., 2019; Alananzeh et al., 2018; Escobar-Rodrigueza & Carvajal-Trujillo, 2013; Lee & Kozar, 2006; Leung et al., 2016), note that the hotel industry has adapted to this technology and is working hard to create portals from which visitors can book rooms online.

However, only a tiny fraction of the tourism and hospitality literature discusses the relative value of numerous website functionality (Ahmad et al., 2020; Jawabreh, 2020; Yılmaz, 2020). A lot of hypotheses are being made as to what effect the internet has on supporting independent hotels in Jordan. Previous analysis has not researched the independent Jordanian hotel in great depth. Reaction to the dissemination of the Internet is essential for hotel firms in particular, as there is a lack of sufficient data on their opinions on the Internet's importance in their sectors and on how they react to the Internet's impact (Essawy, 2011). As there is a rise in the demand for hospitality, there is a new urgency to introduce innovative ways to advance its place in the industry. Selling and distributing goods and knowledge services on hotel channels to local and global audiences is critical, and the most reliable methods of doing so are in terms of online advertisement and delivery. The Internet is a critical marketing platform for customers.

When consumers are able to do more of their product search and book their travel and accommodation, all at once they are constantly requesting conveniences, specialized, accessible, interactive products, and personal interaction with different hotel providers. This hence puts value on the usage of the Internet for tourism, while also supporting the official websites for the sector (Happ & Horváth, 2020; Jawabreh et al., 2020; Mlambo & Ezeuduji, 2020; Orjuela et al., 2020; Ushakov et al., 2021). Hotel websites can be tested for accuracy as a website marketing platform is built for the current website and consumer perspectives. The aim of this research is therefore to suggest an existing assessment system for assessing the current quality of hotel websites and, by doing so, to help increase the quality of hotel websites for hotel chains (Dai & Lee, 2018).

In order to better understand and measure how various dimensions of hotel websites contribute to different elements of customers' preferences, the aim of the

study is to quantitatively analyze the highest current dimension of hotel website evaluations, as well as to recognize distinctions between different hotel website elements and their importance from customers' perspectives.

2 Background of the Study

Many studies have been undertaken to determine the influence of information and communications technology-based marketing tools on company performance and profitability in the tourist and hospitality industry (Jahmani et al., 2020; Law et al., 2014). The tourism and hospitality literature demonstrates an increasing interest in the adoption and use of social media for management and other business operations, notably marketing. Previous studies in the tourism marketing literature have explored and explained various aspects of social media use in this field, including effects of social media on tourist behavior, social media use by tourism organizations by Destination Marketing Organizations (DMOs) and by travel agencies, social media use for co-creation of value and social media use for tourism service personalization and brand management (Kim et al., 2022; Lin et al., 2020). These researches have enhanced knowledge of social media usage in tourist marketing. Tourism marketing is a performance-oriented commercial activity. That is, success or failure of marketing activities is decided by performance results. A performance-oriented activity is described as an activity undertaken by a person or organization that effectively and efficiently induces the behavior and resource allocation required to fulfill a task and to achieve sustained superior performance of the task (Che-Ha et al., 2014). Studies on adoption of service technology systems by enterprises in the hotel sector reveal that the success or failure (Sigala, 2015). Studies of social media usage in tourism-related marketing are quickly developing and several academic works have examined social media use for tourist marketing activities. However, the research reported thus far have utilized a fairly wide viewpoint (Singh & Dhankhar, 2020).

Much of the first research in this area has been undertaken to analyze the quality and functionality of hotel websites (Kang et al., 2021; Law & Wong, 2010; Qandah et al., 2020; Romanazzi et al., 2011; Wan, 2002). A variety of tests have been performed to assess the scope and detail of the knowledge that can be presented to consumers. In light of the findings obtained, these writers recommend that hotel managers provide a "more engaging appearance" on their websites by utilizing the interactive resources accessible on the Internet. The study concludes that cyber-hotels must investigate how these features impact or enhance the purpose, mission, and mechanics of their websites. five-star hotel websites have their own mobile app, which might allow travelers to know explicitly that there are any mobile apps accessible to them, the authors add. The study concluded that hotels use their websites to provide details and purchases, but not to communicate with clients. The author concludes that this implies that they ought to make their platforms more immersive.

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Hotel portals have been an important aspect of the travel and hospitality sector. Reservation knowledge is considered to be the most important dimension, with nearly all of its features considered to be essential. E-commerce activities are marginal among Jordanian hotels. In reality, none of the hotels offer online reservations.

The construction of websites that offer details in other languages, such as English and Arabic, will support visitors who are interested. Hotel portals have been an imperative aspect of the hospitality business, which is why several independent scholars have researched the actions of online travelers in order to consider their preferences and wishes (Lee & Lee, 2021; Widagdo & Roz, 2021). The measurements and characteristics of the upscale hotel on the websites were more significant than on the websites of the economy hotel. A research that explored the relative value of measurements and quality on hotel websites from the point of view of visitors. Jawabreh et al. (2021), proposed a computational model to improve the customer's intention to revisit hotel websites to book hotel rooms. The chain hotels appear to pay greater attention to the facilities offered by the website. Hotels and advertisers need to discuss their image of hospitality, consumer understanding, aspirations and loyalty (Masa'deh et al., 2019). The name of the hotel website is trustworthy and creates familiar amenities and services. Through putting up a website, hotels will improve their purchasing potential, enhance the reputation of the hotel brand and enhance the maximum impact of their marketing campaigns. The assessment of websites is of vital significance, since it can be checked by the degree to which websites satisfy consumer requirements. It involves studies on the effect of the content of the hotel website on sales and the impact of consumers' expectations of the standard of knowledge and the impact of online marketing campaigns on sales.

Most of the work in this field has been conducted to look at the degree of consumer loyalty and the features of websites. A variety of tests have been performed to assess the scope and detail of the knowledge that can be presented to consumers. Richness exists when the flow of knowledge is broader, wider and quicker than it is in the conventional sector. Bad site design would result in a 50% reduction in future revenue due to consumers being unable to locate what they want, according to one report (Li et al., 2015). The authors suggest that hotel managers are willing to have a "more engaging presence" on their websites using the interactive tools available on the Internet. The findings suggest that hotels use their websites to provide details and purchases, just not to communicate with clients, they claim. Take a look at some of the more popular blogs and other web tools on the topic (Jakovic & Galetic, 2014). Hotel websites that offer details in other languages, such as English and Arabic, may allow visitors who are unfamiliar with Iran to find the information they need. It is proposed that a range of transactional and relationship-building practices in the hotel industry in Jordan and around the world will rise in the immediate future. The study found that web design features are essential for online partnership marketing and web design is a core part of web marketing strategy in the travel industry.

Hotel portals are also at the forefront of the promotion and service of hotels. A well-designed website is the most significant marketing tool for the hotel in today's

fast-growing information period. Increasing numbers of researchers are paying attention to website design (Caglione et al., 2009) found that website adoption was positively connected to the success indicator Revenue per Accessible Space. They also noticed that sales growth rates were higher for hotels with their own websites than for hotels with an online presence only via regional portals (Hu, 2009). The "first image" of a hotel has now been moved from the front desk to its website.

The research aims to address the question: What is the strongest dimension in the assessment of the hotel's website? What are the contents? From the customer's point of view, what is the most important feature of the website for the hotel? Are there any gaps in the consistency of new hotel websites and the importance of these contents from the point of view of the customer (Zeki & Alrawadieh, 2017)? Provided a tool for analyzing the websites of international tourist hotels (O'Connor, 2007). Indicated that the assessment of the standard of electronic facilities on the travel platform should be viewed as a multi-criteria decision-making procedure. Hu's requirements are performance, enforcement, device availability, security/privacy, accessibility, reimbursement, communication, and gain. Law and Bai (2007) announced that the effective website of the hotel should be both accessible and functional (Wong & Law, 2005). The following research described the accuracy of details as the most critical aspect of a good hotel website.

Chung and Law (2003) created an information quality measurement model to calculate the efficiency of the hotel website. Law and Cheung (2005) considered the reservation information and website administration to be the measurements with the largest and smallest weights, respectively, the weight meaning representing the perceived significance of the dimension. In comparison to previous reports, the study discussed here focuses solely on a single feature, i.e., the cultural factors of the destination knowledge dimension.

3 Methodology

In this research, the Computational Package for Social Sciences (SPSS) was first used for data entry, and later for data interpretation. Data processing was the initial phase aimed at transforming raw data to a more standardized format that is more suitable for study. Tasks at this point involved data editing, data coding and data entry. Descriptive figures were used to outline the attributes of the respondent, including demographic details such as age, gender; questions about the identity of the participating organization, such as consumer numbers, were also included. Inferential statistics were often used to evaluate theories to assess the association between variables. In specific, the Pearson Correlation was used to check the relationship of the interval amount with the construct, while the Chi-square was used to confirm the association between the nominal variables and the construct. In addition, the Cronbach coefficient alpha was used for the measure of durability. Finally, the Variable Analysis Technique, Variance Analysis (ANOVA) was used to analyze the contents of the official tourist website of the Jordan case study: existence-importance summary (Fig. 1).

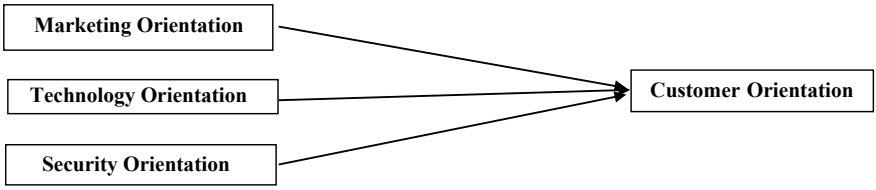

Fig. 1 The model of the study

3.1 Research Hypothesis

H1: There is a statistically relevant effect of Marketing orientation and Customer Orientation of classified hotels in Jordan.

H2: There is a statistically relevant effect of Technology Orientation and Customer Orientation of classified hotels in Jordan.

H3: There is a statistically relevant effect of Security Orientation and Customer Orientation of classified hotels in Jordan.

3.2 Sample Research

The study sample consisted of (100) workers employed in graded Jordanian hotels who were randomly chosen from the study population (Table 1).

3.3 Reliability

To ensure the reliability of the analysis used by Cronbach's Alpha equation to sample the initial analysis, in order to know the stability of the internal consistency for each area of research, Table 2 explains.

Table 2 displays the reliability coefficient for products with high loading where the range of values (0.797–0.950) is adequate.

4 Results

This section comprises the findings of the report, which seeks to analyze the contents of the five-star hotel website for a case study. Jordan: life—significance review; the following is a presentation of the findings, focused on the conclusions of the study:

H1: The marketing orientation and consumer orientation of categorized hotels in the city of Jordan has a statistically relevant effect.

Table 1 Indicates the informative personality trait statistics

Percentage	Frequency	Group	Variable
60.0	60	Male	Gender
40.0	40	Female	
0.00	0	Less than 20 years	Age
20.0	20	21–30 year	
20.0	20	31–40 year	
40.0	40	41–50 year	
20.0	20	51–60 year	
0.00	0	61 years and more	
20.0	20	Less than 1000$	Monthly income
10.0	10	1001$–1500$	
10.0	10	1501–2000	
60.0	60	More than 2001$	
50.0	50	Private sector	Occupation
50.0	50	Public sector	
0.00	0	High school	Education
70.0	70	Bachelor's degree	
20.0	20	Master's degree	
10.0	10	Post graduate	
30.0	30	European	Nationality
30.0	30	Asia	
30.0	30	USA	
10.0	10	Australian	
0.00	0	Canada	
0.00	0	Others	
100.0	100	Total	

Table 2 The values of reliability coefficient by Cronbach's alpha

Factors	Cronbach's alpha
Customer orientation	0.797
Marketing orientation	0.848
Technology orientation	0.805
Security orientation	0.950
Tool overall	0.928

To be confident, we used the Basic Linear Regression Analysis as seen below.

The following is seen in the Table 3. The meaning ($F = 56.534$) and the statistically meaningful value (0.00) are smaller than the statistically significant amount ($\alpha \leq 0.05$). The simple linear regression model is therefore suitable for the estimation of

the causal relationship between the independent variable (marketing orientation) and the dependent variable (customer orientation).

The value of the correlation coefficient between the independent variable (marketing orientation) and the dependent variable (customer orientation) was (0.605), the value of the coefficient of determination (R^2) (0.366) and the value of the changed coefficient of determination (Adjusted R^2) (0.359) which indicates that the independent variable (marketing orientation) should be explained (35.9).

There is a statistical significance of the coefficient of simple linear regression equation associated with the independent variable (marketing orientation) where the value ($T = 7.519$) shows the impact of the effect (marketing orientation) on the independent variable (marketing orientation) (Customer Orientation). There is therefore a substantial significance for the coefficient of simple linear regression equation (0.605), which was a positive result, and we therefore accept the statement that 'There is a statistically significant impact on the marketing and customer orientation of classified hotels in the Jordan.

H2: The influence of Technology Orientation and Consumer Orientation of Categorized Hotels in Jordan is statistically important.

To be confident, we used the Basic Linear Regression Analysis as seen below.

The following is seen in the Table 4. The meaning ($F = 148.09$) and the statistically meaningful value (0.00) are smaller than the statistically significant amount ($\alpha \leq 0.05$). As a consequence, a simple linear regression model is suitable for evaluating the causal relationship between the independent variable (technology orientation) and the dependent variable (technology adoption) (customer orientation).

The coefficient of correlation between the independent variable (technology orientation) and the dependent variable (customer orientation) was (0.776), the coefficient of determination (R^2) was (0.602), and the updated coefficient of determination (Adjusted R^2) was (0.598), both of which mean that the independent variable (technology orientation) should be explained (59).

Table 3 The results for simple linear regression

R	R^2	Adjusted R^2	F	Sig*	Regression coefficients				
					Domain	β	Std error	T	Sig*
0.605	0.366	0.359	56.5	0.00*	Marketing orientation	0.605	0.045	7.519	0.00*

* Statistically significant at the level of statistical significance ($\alpha \leq 0.05$)

Table 4 Effects of basic linear regression

R	R^2	Adjusted R^2	F	Sig*	Regression coefficients				
					Domain	β	Std error	T	Sig*
0.776	0.602	0.598	148.0	0.00*	Technology orientation	0.776	0.041	12.169	0.00*

* Statistically significant at the degree of statistical importance ($\alpha \leq 0.05$)

Table 5 The outcomes of a basic linear regression study

R	R^2	Adjusted R^2	F	Sig*	Regression coefficients				
					Domain	β	Std error	T	Sig*
0.480	0.231	0.223	29.359	0.00*	Security orientation	0.480	0.038	5.418	0.00*

* Statistically significant at the degree of statistical importance ($\alpha \leq 0.05$)

The coefficient of a basic linear regression equation in relation to the independent variable (technology orientation) has statistical significance, with the value ($T = 12.169$) suggesting the influence (technology orientation) on the independent variable (technology orientation) (Customer Orientation). As a consequence, the coefficient of the simple linear regression equation (0.776), which was a positive influence, has a significant impact, and we accept the statement that "Technology Orientation and Customer Orientation of Classified Hotels in the Aqaba Area have a statistically significant impact."

H3: There is a statistically important effect of the Security Orientation and Consumer Orientation of confidential hotels in Jordan.

To be confident, we used the Basic Linear Regression Analysis as seen below.

The following is shown in the Table 5. The meaning ($F = 29.359$) and the statistically meaningful value (0.00) are smaller than the statistically significant amount ($\alpha \leq 0.05$). The association between the independent variable (security orientation) and the corresponding relationship between the dependent variable (correlation) (customer orientation. The correlation coefficient between the independent variable (security orientation) and the dependent variable (customer orientation) was (0.480), with an R^2 of (0.231) and an Updated R^2 of (0.223) indicating that the independent variable (security orientation) could be explained (22.3%).

The coefficient of basic linear regression equation, which is associated with the independent variable (security orientation), has statistical significance (there is a meaningful association between the coefficient and the independent variable) (Customer Orientation). Thus, this implies that the coefficient of the basic linear regression equation (0.480), which was a positive effect, follows the statement that.

5 Conclusion

The statistical relevant number ($\alpha \leq 0.05$) is less than the significance ($F = 56.534$) but not smaller than the statistically meaningful value (0.00). Since the independent variable (marketing orientation) is the source of the causal interaction between the dependent variable (customer orientation) and the company, it is better to use a simple linear regression model. Correlation coefficient between independent and dependent variables (marketing orientation and consumer orientation) was (0.605), R^2 (0.366)

and Updated R^2 (0.359) both indicate that the independent variable (marketing orientation) may be rendered clearer. Pragmatism comes from a belief in our own abilities to work it out as we move along.

Coefficient of basic linear regression has statistical significance where value (T = 7.519) denotes the effects on the independent variable (marketing orientation) (Customer Orientation). Accordingly, there is a considerable impact on the coefficient of simple linear regression equation (0.605), which is a good impact, and we accept the argument that "Jordan Advertisement and Customer Orientation Classified Hotels have a statistically important effect on their categorization." When it comes to the advertising and consumer care aspect of hotels, hotel portals are masters. In today's dynamic environment, the website is the most important marketing asset. The rise in the number of scholars who study website design suggests that increased emphasis on website design is warranted. Website adoption was positively related to revenue per accessible area, according to O'Connor (2007). They observed that revenue growth rates were often higher for hotels with a website to which consumers could only resort from regional portals rather than for hotels with a presence on both the global and regional internet. "First pic" for a hotel is now on the website rather than on the front desk. According to Law and Wong, hotels should make their websites more interesting. According to them, just 20.00% of Croatia's five-star hotel websites have their own mobile app. According to the findings, cyber-hotels should look at how these elements affect or improve the purpose, goal, and mechanics of their websites.

Visitors unfamiliar with Jordan may be able to discover information on hotel websites that provide data in other languages, such as English and Arabic. In today's fast-paced information age, a well-designed website is the most important marketing tool for the hotel. The goal of the study is to find out what the most important factor is when evaluating a hotel's website. What are the contents of the package? What is the most significant element of the hotel's website from the customer's perspective?

Are there any inconsistencies in the consistency of new hotel websites, as well as the significance of these items from the customer's perspective? The research focuses exclusively on a particular characteristic, namely, the cultural variables that influence destination knowledge.

Although the explanation is described as 12.169, it represents the impact of the influence (technology orientation) on the independent variable (technology orientation) (Customer Orientation). To this end, it is necessary to reflect on the coefficient of the simple linear regression equation (0.776), which was a positive influence, and thus lend legitimacy to the finding that "The Technology and Customer Inclination of Classified Hotels in Aqaba Area has a statistically significant impact." The coefficient of basic linear regression associated with the independent variable (security orientation) has statistical significance (meaning: T = 5.418). (Customer Orientation). Also, because of this, we may infer that "The Protection Orientation and Customer Orientation of Classified Hotels in Aqaba Area has a statistically relevant effect".

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The Awareness and Confidence About COVID-19 Vaccines Among Selected Students in Faculty of Health Sciences: Comparison Study Among Malaysia, Pakistan and UAE

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Abstract The COVID-19 pandemic has impacted the world in an unpredictable way, affecting economic, socio-cultural, political, environmental statuses and billions regardless of privilege and wealth. Vaccines were developed quickly, for protection against the Coronavirus, as well as to curb the pandemic. This study aimed to (1) compare awareness about risks and benefits of getting vaccinated against COVID-19,

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_132

(2) compare the confidence in usage of vaccines for protection against the COVID-19 (3) determine the association between awareness about risks and benefits of the COVID-19 vaccine and confidence in getting it among selected undergraduate students in the Faculty of Health Sciences in Malaysia, Pakistan and UAE. A quantitative cross-sectional study was carried out using an online validated questionnaire with a 3-point Likert scale, which consisted of three domains, namely sociodemographic, awareness on risks and benefits of the vaccine, and confidence in getting the vaccine. Subjects were Faculty of Health Sciences' undergraduate students from three institutions; one each in Malaysia, Pakistan and UAE, that were recruited through non-probability sampling techniques; convenience and snowball sampling. The subjects' obtained scores on awareness and confidence from each country were averaged, and then compared between the countries using One-Way-ANOVA. Pearson's correlation was used to determine the association between awareness and confidence of the students. All data were analyzed using SPSS version 27.0. A number of 405 students from the three countries; Malaysia (142), Pakistan (124) and UAE (139) participated in this study. One-Way-ANOVA showed that students in Pakistan scored the highest mean awareness with a 1.55 ± 0.23 score, followed by UAE (1.53 ± 0.29) and Malaysia (1.49 ± 0.19). For confidence, students in Malaysia scored the highest mean confidence with a 1.25 ± 0.25 score, followed by Pakistan (1.24 ± 0.31) and UAE (1.20 ± 0.23). Pearson's correlation showed that there was a statistically significant association ($p < 0.001$, $r = 0.442$) between the students' awareness (1.52 ± 0.24) and confidence (1.23 ± 0.26) of getting COVID-19 vaccines. The study found that students in Pakistan had the highest awareness, followed by UAE and Malaysia. Whereas students in Malaysia had the highest confidence followed by Pakistan and UAE. There was a significant association found between the students' awareness regarding the benefits and risks of COVID-19 vaccines and their confidence in getting it.

Keywords COVID-19 · Vaccine · Undergraduate students · Awareness · Confidence

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1 Introduction

Coronavirus Disease (CO = Corona; VI = Virus; D = Disease) a.k.a. COVID-19 is defined by the World Health Organization (WHO) as a newly determined virus that spreads through direct contact with respiratory droplets (aerosol) of the infected person in the form of a cough and/or a sneeze. This new virus and disease was unknown before the outbreak began in Wuhan, China, in December 2019 (Al-Sabbah et al., 2021; Lau, 2020; Looi, 2021; Lorini et al., 2018; Lucia et al., 2021; Muqattash et al., 2020; Polit & Beck, 2006; Polit et al., 2007; Regmi et al., 2016; Saied et al., 2021; Sanche et al., 2020; Shafi et al., 2020; Sharma et al., 2021; Sonawane et al., 2021; Syed Alwi et al., 2021; Wadood, et al., 2020; Xu, 2020). The COVID-19 pandemic is being viewed as the most significant worldwide health crisis of the century and one of the biggest challenges since World War II (Aljumah et al., 2021; Alshurideh et al., 2021; Chakraborty & Maity, 2020). It has been named the sixth public health emergency of the last ten years, internationally, by the WHO (Gallegos, 2020). This pandemic has not only led to a large number of fatalities, and health crises but also severe economic difficulties all over the world (Al-Dmour et al., 2021a; Al-Hamad et al., 2021; Chakraborty & Maity, 2020; Leo et al., 2021). The COVID-19 affected people across the world, unsettling and disrupting 'routine' in the lives of many. In almost all countries affected by COVID-19, entire educational, commercial institutions were closed and non-emergency health services were also suspended (Ali & Gatiti, 2020; Al-Maroof et al., 2021; Creese et al., 2021; Shah et al., 2021).

Being very highly contagious, the novel coronavirus virus spread to more than 200 countries. The virus is known to spread through aerosol or droplets emitted from the nose and mouth; hence threatening its transmission among humans through close contact (Alameeri et al., 2021; Al-Dmour et al., 2021b; Nuseir et al., 2021; Sanche et al., 2020). This led to a large majority of countries imposing complete or partial lockdowns since January and February 2020 (Ahmad et al., 2021; Al Khasawneh et al., 2021; Harahsheh et al., 2021; Lau, 2020). Although the symptoms varied from mild to moderate in severity, approximately 1 out of every 6 patients diagnosed with COVID-19 was likely to become seriously ill and develop difficulty breathing, with progression of disease. Older people, and those with underlying medical problems like high blood pressure, heart problems, diabetes and/or individuals with weak immunity systems, are more likely to develop serious illnesses (Sanche et al., 2020).

The second wave of COVID-19 has hit Asia badly (Looi, 2021), and has caused countries to declare a state of emergency in the respective countries. In Malaysia, the government has employed several measures like putting in order the Movement Control Order, stringent screening process at all airports and economic help to the needy citizens, as well as providing COVID-19 vaccines for free. Similar efforts have been observed by countries in Asia such as the United Arab Emirates and Pakistan, where a lockdown was imposed, work from home was enforced and educational institutions initiated online academic instruction (Al-Sabbah et al., 2021).

The COVID-19 vaccine which was well developed on a war footing in the developed countries (Kakar et al., 2021). At least 198 countries have begun the process

of inoculating their populations against COVID-19, mobilizing more than a dozen vaccines for emergency use: from the American-manufactured Pfizer-BioNTech and Moderna jabs, to the Chinese Sinopharm and SinoVac. As of the Summer of 2021, more than three billion doses have been administered worldwide. But while several countries—such as the United Arab Emirates (UAE)—have been able to make significant headway towards vaccinating their citizens, others such as Malaysia and Pakistan are gradually stepping up the number of vaccines being administered per day.

Generally, the acceptance and demand of vaccines are complex in nature and are perceived differently by the behavioral nature in the communities (Biasio et al., 2021; Creese et al., 2021; Dutta, 2020). It is more complex when it is needed to be accepted in a pandemic as the nature of vaccines produced are not much known, hence hesitancy from people is very much to be predicted. Hesitancy in receiving the vaccines can be due to various factors like and also due to the already existing anti-vaccine movement which has been misleading and confusing the public, by propoganding mistrust in the system that is delivering the vaccination program (Saied et al., 2021). Therefore, this study will specifically look into examining the awareness and confidence about COVID-19 vaccines among selected students in the Faculty of Health Sciences: comparison study among Malaysia, Pakistan and UAE. In this study, the participants will be only from the Health Sciences Department for two reasons: (a) as healthcare providers, it will be mandatory to receive the vaccine and (b) hesitancy among the healthcare providers will affect the public negatively (Karim et al., 2020; Sharma et al., 2021).

The main objective of this study is to determine the awareness about the risks and benefits of the COVID-19 vaccine among selected undergraduate students in the Faculty of Health Sciences in Malaysia, Pakistan and UAE and their confidence in getting the vaccine. This study aimed to determine the awareness regarding the risks and benefits of the COVID-19 vaccines among selected undergraduate students in the Faculty of Health Sciences in Malaysia, Pakistan and UAE, and their confidence in getting the vaccine.

The on-going global discussion on the safety of the COVID-19 vaccines are potentially leaving communities undecided on whether to trust or not to trust. The concept of 'vaccine hesitancy' can be described as either to prolong or refuse in accepting vaccines that are made available (Gallegos, 2020; Sharma et al., 2021). Generally, vaccine hesitancy which starts with an individual will consequently affect the whole community with the similar hesitancy. And, in order to achieve the herd community, a high coverage rate of the vaccinated population is needed in the efforts to flatten the epidemic curve (Syed Alwi et al., 2021; Wadood, et al., 2020). Vaccine hesitancies are said to be specific to the environment and to be fluctuating in accordance to time and setting. In addition, it is prompted by factors like confidence and awareness (Saied et al., 2021; Sharma et al., 2021). Hence by examining the factors of awareness and confidence in getting COVID-19 vaccines, basic perception of the vaccine can be established.

2 Literature Review

2.1 Awareness Regarding the Risks and Benefits of COVID-19 Vaccines

Awareness denotes trust in vaccination safety, and the knowledge about the vaccines. In this pandemic, people are getting much information and resources of COVID-19 vaccines through various sources including television, radio, newspaper, social media, friends, healthcare providers, governments and NGOs. This information obtained, will shape their awareness level towards the COVID-19 vaccines (Domek et al., 2018), hence it is crucial to disseminate transparent and accurate information about the vaccine safety and efficacy to create a well-informed population (Alkalha et al. 2012; Domek et al., 2018). As advocated by Krejcie and Morgan (1970) people generally trust scientists the most followed by healthcare providers and agencies. Thus, if a country is trying to raise the awareness level of their citizens in this vaccine, all these agencies should team up to create awareness. Without proper awareness, the scene with vaccine hesitancy will continue to grow (Polit et al., 2007).

In a survey of 1068 medical students in India reported that they agree vaccines should be mandatory however they wanted an increase in vaccine advocacy to encourage those who were hesitant in getting it (Hui et al., 2020). This clearly describes low awareness, as they know it is important to receive the vaccine, however they aren't aware of the benefits, safety and efficacy of the vaccines. Similarly, in another study conducted by AlQutob et al. (2020) reported that poor acceptance of COVID-19 vaccines in Jordan is due to the lack of transparency and information dissemination from the national and public health authorities. A survey conducted among the Malaysians, reveals that Malaysians have a high rate of acceptance, but it still remains important to increase their awareness level in vaccine safety and effectiveness (Syed Alwi et al., 2021). Similarly, Pakistan reports have ample understanding on the vaccines and efforts for awareness should be uplifted (Yusoff, 2019a, 2019b).

2.2 Confidence in Getting COVID-19 Vaccines

Confidence denotes trust in vaccination safety, effectiveness and competence of the healthcare system. There is an overlap here with awareness and confidence as we can see with awareness, only then confidence can be built. The overlap factor is vaccination safety, so if the population is aware of the safety, then the confidence in effectiveness and the trust in the healthcare system can be established. Confidence is one of the major factors in vaccine hesitancy as the concerns of the safety, efficacy and the rush in vaccine development and production due to pandemic are lingering in the mind of the population. In addition, many rumors are also being spread which

does not help this situation (Lorini et al., 2018; Lucia et al., 2021; Sonawane et al., 2021; Xu, 2020).

As illustrated in the result of a survey of 186 medical university students in Jeddah, the majority of the students were aware of the risks of COVID-19, but 44% of them were hesitant in getting the vaccine. Of these 68.3% were concerned about vaccine side effects. The study recommended vaccine advocacy through educational programs (Chakraborty & Maity, 2020). This shows that there is some kind of awareness level among the participants, however the trust or confidence is not achieved. And to establish confidence, government health departments must ensure that 'good' information is released for public consumption, to ensure their trust towards COVID-19 vaccine (Chakraborty & Maity, 2020; Kakar et al., 2021).

3 Method

The focus in this study is to determine the awareness and confidence level among selected students from the Faculty of Health Sciences on the COVID-19 vaccine. Since COVID-19 is posing to be one of the major threat to the entire population and Asian countries (Lau, 2020), this study would be one of the pioneers in assessing the awareness and confidence level about COVID-19 among undergraduate students in Faculty of Health Sciences in these three countries (Malaysia, Pakistan & UAE), providing a more scientific backup for relevant parties to gear up their efforts in advocating about COVID-19 vaccines in the effort to flatten the pandemic curve.

3.1 Study Design

A quantitative cross-sectional study was conducted for a period of around one week from 29th May to 5th June, 2021.

3.2 Population and Sample

Subjects selected were among undergraduate students in the Faculty of Health Sciences from three universities: Universiti Kebangsaan Malaysia (UKM) in Malaysia, Ziauddin University (ZU) in Pakistan and Fatima College of Health Sciences (FCHS) in UAE. Non-probability sampling strategies through a convenience and snowball sampling technique were used to target all students that consented to fill in an online questionnaire.

The sample size was determined based on Krejcie and Morgan (1970) formula,

$$s = X^2NP(1 - P) / \left[d^2(N - 1) + X^2P(1 - P)\right]$$

According to the formula, s is the required sample size; X^2 is the table value of chi-square for 1 degree of freedom (3.841) at the desired confidence level of 0.05; N is the population size of 4000, P is the population proportion (assumed to be 0.50 since this would provide the maximum sample size) and d is the degree of accuracy expressed as proportion of 0.05. Based on the formula, the calculated sample size was 351. It was assumed that there would be a 10% drop rate in response. Hence, the required sample size was,

$$s = 351 + (10\% \times 351) = 351 + 35 = 386$$

3.3 Questionnaire's Validity and Reliability

The instrument used was a questionnaire adapted from studies by Al-Sabbah et al. (2021), Muqattash et al. (2020), Biasio et al. (2021). The adapted questionnaire that was named as Student COVID-19 Vaccine (STU-COV) Questionnaire, had three main domains in which were sociodemographic data, awareness on risks and benefits of the vaccine and confidence in getting the vaccine. In this questionnaire, the awareness and confidence domain used a 3-point Likert scale.

Collecting data for a questionnaire based study through traditional techniques (face to face) could be expensive, uncomfortable, unsafe (during the COVID-19 pandemic) and time consuming. The emerging data collection technique based upon internet/e-based modern technologies like online platforms (e.g. SurveyMonkey) was relatively a cost effective approach. These unique data collection techniques could collect a huge number of responses from participants in a short time frame as well as it would be a solution for a situation like COVID-19 pandemic, where no face-to-face contact was recommended (Khan et al., 2020).

Moreover, there was significant evidence that several large cross-country researches had actually been completed making use of online sets of questions to collect different types of data through popular dedicated platforms (e.g. https://www.surveymonkey.co.uk) (Regmi et al., 2016). That's why an anonymous online structured questionnaire was designed using Survey monkey to save time and make it more comfortable for the participants from the three different countries. The link for the questionnaire was exclusively shared by email with the undergraduate students—both individually and through their social media groups. Non-probability sampling strategy through a convenience and snowball sampling technique was used to target all students in the Faculty of Health Sciences consenting and willing to fill the survey. Upon completion of the survey, data was downloaded as a form of SPSS from Survey monkey platform, format and data analysis was conducted using SPSS software version 27.0.

The questionnaire had been tested for validity and reliability, in which two validation protocols i.e. face validation and content validation were conducted for all

domains in order to validate the newly developed questionnaire. Whereas, Cronbach's Alpha was used to test for reliability for the awareness and confidence domain. In the pretest of the questionnaire, six experts were involved in the content validation, nine students from the Faculty of Health Sciences were involved in the face validation, and 30 students (10 students from each country) from the Faculty of Health Sciences were recruited to check on the reliability of the STU-COV Questionnaire. The acceptable Face Validity Index (FVI) and Content Validity Index (CVI) values for face validation and content validation are both more 0.83 (Hui et al., 2020).

Meanwhile, the acceptable values for Cronbach's Alpha are 0.70 for 10 items and more (awareness domain), and 0.50 for less than 10 items (confidence domain) (Hui et al., 2020; Looi, 2021). Based on the validity and reliability test conducted, the STU-COV Questionnaire achieved a FVI and CVI values of more than 0.83 for all three domains. Whereas the awareness and confidence domain showed acceptable Cronbach's Alpha value of 0.78 and 0.56.

4 Data Analysis and Findings

A p-value of less than or equal to 0.05 was taken as significant. Data analysis was done using SPSS version 27.0.1.0 and Microsoft Excel. One-Way ANOVA was performed to compare the awareness about the risks and benefits of getting vaccinated against the COVID-19 among selected students in Malaysia, Pakistan and UAE, and also to compare the confidence in the usage of vaccines for protection against the COVID-19 among selected students in the three countries. For determining the association between the awareness about the risks and benefits of the COVID-19 vaccine among selected students and their confidence in getting the vaccine, a Pearson's Correlation test was conducted.

Table 1 showed the sociodemographic characteristics of the subjects. N = 405 students had participated in the study.

4.1 Awareness About the Risks and Benefits of COVID-19 Vaccines

As seen in Table 2 students from Pakistan had the highest awareness (1.55 ± 0.23) compared to UAE (1.53 ± 0.29) and Malaysia (1.49 ± 0.19). One-Way ANOVA was used to compare the awareness about the risks and benefits of getting vaccinated against the COVID-19 among the selected students between the three countries. The test showed that there was no statistically significant difference ($p > 0.05$) on the awareness regarding risk and benefit of COVID-19 vaccines among the students in the three countries.

Table 1 Sociodemographic characteristics

Variable	n (%)	Mean (SD)
Age (year)		21.34 (2.38)
Sex		
Male	47 (11.6)	
Female	358 (88.4)	
Country		
Malaysia	142 (35.1)	
UAE	139 (34.3)	
Pakistan	124 (30.6)	
Year of study		
1st year	95 (23.5)	
2nd year	105 (25.9)	
3rd year	103 (25.4)	
4th year	89 (22.0)	
5th year	13 (3.2)	
Major		
Physical therapy	75 (18.5)	
Occupational therapy	45 (11.1)	
Medical technology	19 (4.7)	
Radiology/medical imaging	76 (18.8)	
Nursing	109 (26.9)	
Emergency health	57 (14.1)	
Speech language therapy	10 (2.5)	
Psychology	13 (3.2)	
Others	1 (0.2)	
Sources of information		
Printed media	62 (15.3)	
Radio/television	147 (36.3)	
Social media	343 (84.7)	
Internet	274 (67.7)	
Scientific journal	57 (14.1)	
Official site	191 (47.2)	
Other	8 (2.0)	

The percentage of respondents who relied on the updates of information from authorized organizations were 95.1% for Malaysia, 87.8% for UAE and 88.7% for

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Table 2 The comparison on level awareness of risks and benefits of COVID-19 vaccines among selected students in Malaysia, Pakistan and UAE

Country	Score of awareness (Mean ± SD)	F statistic	*p-value
Pakistan (n = 124)	1.55 ± 0.23	1.890	0.152
UAE (n = 139)	1.53 ± 0.29		
Malaysia (n = 142)	1.49 ± 0.19		

* There is a significant association according to the One-Way ANOVA test ($p < 0.05$)

Pakistan. It was reported in Fridman et al. (2020) that more than half of the respondents who aged less than 25 years old in USA got their information from Communicable Disease Centre (CDC) (64.7%), local health department (63.7%) and WHO (59.2%), which is lower from the findings from this study.

4.2 Confidence in Getting COVID-19 Vaccines

According to Table 3, students from Malaysia had the highest confidence (1.25 ± 0.25) compared to Pakistan (1.24 ± 0.31) and UAE (1.20 ± 0.23). One-Way ANOVA was used to compare the confidence of getting COVID-19 vaccines among selected students in Malaysia, Pakistan and UAE. The test showed that there was no significant difference ($p > 0.05$) on the confidence of getting COVID-19 vaccines among students in the Faculty of Health Sciences in between the three countries.

This study found that 95.1% respondents from Malaysia, 92.1% respondents from UAE and 83.1% of the respondents from Pakistan trusted the healthcare sector in providing accurate and reliable information. In comparison with the results of this study, Imperial College London (2021) reported that confidence in the healthcare sector varies markedly between countries across the globe, ranging from the highest level of confidence on their healthcare sector (70%) in United Kingdom (n = 5005), and the lowest level of confidence (42%) in South Korea (n = 2460). This discrepancy was probably because the targeted population in this study were well-informed undergraduate students from healthcare sectors. Thus, the result could not be generalized into the general population (Saied et al., 2021; Sonawane et al., 2021).

Table 3 The comparison on awareness of getting COVID-19 vaccines among selected students in Malaysia, Pakistan and UAE

Country	Score of confidence (Mean ± SD)	F statistic	*p-value
Malaysia (n = 142)	1.25 ± 0.25	1.493	0.226
Pakistan (n = 124)	1.24 ± 0.31		
UAE (n = 139)	1.20 ± 0.23		

* There is a significant association according to the One-Way ANOVA test ($p < 0.05$)

Table 4 The correlation between awareness about the risks and benefits of the COVID-19 vaccine among selected students and their confidence in getting the vaccine

Item	Mean ± SD	Pearson's correlation (r)	p-value
Awareness	1.52 ± 0.24	0.442	0.001*
Confidence	1.23 ± 0.26		

* There is a significant association according to the One-Way ANOVA test ($p < 0.05$)

4.3 Association Between the Awareness of Benefit and Risk of the COVID-19 Vaccines

Pearson's Correlation was used to determine the correlation between the awareness of benefit and risk of the COVID-19 vaccines among selected students and their confidence in getting the vaccines. Table 4 showed that there was a statistically significant correlation between the awareness of benefit and risk of COVID-19 vaccines among selected students and their confidence in getting the vaccines ($p< 0.001$). Even though the correlation was found to be weak, it was a positive correlation ($r = 0.442$). In their systematic review, Biasio et al. (2021) also found that there was an association between health literacy and vaccination status.

5 Discussion and Conclusion

In conclusion, this study found that there were no significant differences between awareness and confidence level among undergraduates in the Faculty of Health Sciences in Malaysia, Pakistan and UAE. In these three developing countries, the majority of the participating students have awareness on risks and benefits of COVID-19 vaccines. Moreover, most of the students obtained the information from the internet and social media. Hence, government and authorities could use these platforms to educate and create awareness continuously to encourage vaccine uptake among university students, as well as to strengthen overall immunization for COVID-19. It was also found that the confidence level was related to their awareness, thus increasing the awareness of risks and benefits of vaccination would also increase their confidence level in getting it.

6 Recommendations

Questionnaires such as ours could be considered as an important tool that can be applied into a larger population to measure the level of awareness and confidence in getting the vaccine. To ensure increased awareness and confidence among the general population, the elements that define and create awareness should be understood and

thus, interventions can be crafted accordingly. A randomized sampling method also can be used to represent the real population. A thematic analysis can be done using a qualitative approach for this study in the future. More participants can be recruited for future study.

7 Limitations

This study recruited university students from the Faculty of Health Sciences only, who can be considered to have more awareness about the vaccine in comparison with the general population of any of the three countries at large. Moreover, this study could not determine the cause-and-effect relationship between the awareness and confidence in getting the COVID-19 vaccine. This study only measured the samples' awareness and confidence at one period of time.

Acknowledgements The authors would like to express their gratitude to everyone who participated in the pilot study and helped validate the STU-COV. The authors also acknowledge all students who have participated in this study. We would also like to acknowledge the Faculty of Health Sciences UKM, ZU and FCHS.

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Predicting Bitcoin Prices Using ANFIS and Haar Model

Jamil J. Jaber, Rami S. Alkhawaldeh, Samar M. Alkhawaldeh, Ra'ed Masa'deh, and Muhammad Turki Alshurideh

Abstract This study aims to model and enhance the forecasting accuracy of cryptocurrency market data patterns using the daily bitcoin (BTC) close price data with 1535 observations from December 2017 to January 2022. The model employs a nonlinear spectral model of maximum overlapping discrete wavelet transform (MODWT) with Haar mathematical functions in conjunction with an adaptive network-based fuzzy inference system (ANFIS). We have selected the logarithm volume of bitcoin (LV) and logarithm trade count (LCT) as input values according to correlation and multiple regressions. The input and output variables have been collected from the cryptocurrency market. The performance of the proposed model (MODWT-Haar-ANFIS) is compared with traditional models that are the autoregressive integrated moving average (ARIMA) model and the ANFIS model. The obtained results show that the performance of MODWT-Haar-ANFIS is better than that of the traditional models. Therefore, the proposed forecasting model is a promising approach that capable of deploying in the cryptocurrency markets.

Keywords Haar model · Bitcoin · Fuzzy model · Forecasting · ANN

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_133

1 Introduction

Financial markets refer to any location or system that allows buyers and sellers to exchange financial instruments such as bonds, shares, foreign traditional currencies, cryptocurrency, and derivatives (Madura, 2020). Financial markets enhance the transfer of surplus cash from savers (surplus cash(to institutions (deficit cash), who subsequently invest them in productive activities. Financial markets encourage players to raise cash and transfer risk through derivatives contracts (forward, future, option) (Madura, 2020). Capital markets are used for long-term financing, whereas money markets are used for short-term finance. The financial market mainly is divided into two parts: primary markets and secondary markets. The primary market deals with the exchange of initial public offering (IPO) of new financial products, whereas the secondary market deals with the exchange of previously issued financial products. There are many types of financial markets such as capital markets, money markets, cryptocurrency markets, derivatives markets, and commodity markets. The capital markets provide long term investment such as stock and Bond. The money markets provide short term debt financing, while the cryptocurrency markets trade digital assets and financial technologies. The derivatives markets give mechanisms for managing financial risk, while commodity markets trade product such as gold, oil, livestock, and wheat (Hull, 2014).

Cryptocurrency is a digital currency that operates without the assistance of a central bank and uses encryption techniques to regulate unit generation and verify payment transfers. It's more accessible, more widely available, and has grown in popularity over time to become one of the most extensively used forms of currency worldwide. Cryptocurrency has been around since 2009, but it wasn't until 2017 that it became popular as a means of investing. The use of encryption to authenticate transactions is referred to as cryptocurrency. This means that cutting-edge code is being utilized to store and transfer cryptocurrency data between wallets and public ledgers. The purpose of encryption is to assure security and safety. Cryptocurrencies are built on blockchain, a decentralized public database that records all transactions that are updated and maintained by currency holders (Fang, 2022). Cryptocurrency units are created through a process known as mining, which entails using computer processing power to solve complicated mathematical problems in order to generate coins. Users can also buy the currencies via brokers, keep them in digital wallets, and spend them.

Advantages of trading cryptocurrency. First, drastic changes refer to the volatility of cryptocurrencies, which is typically likely to attract the curiosity of speculators and investors. The quick volatility of daily prices can give traders with excellent money-making chances, but they also carry a higher level of risk. Second, the cryptocurrency market is open 24 h a day, seven days a week because it is a decentralized market. Third, it offers certain advantages in terms of privacy to investors. Four, peer-to-peer transactions are one of the most significant advantages of cryptocurrencies is that they do not require the involvement of financial institution middlemen. This

can minimize transaction costs. Furthermore, this functionality may attract to individuals who are distrust of traditional systems. Some cryptocurrencies can provide holders with additional benefits, such as limited ownership and voting rights (Fang, 2022). Disadvantages of trading cryptocurrency; First, the limitations of technical infrastructure, transaction volume, and transaction speed make it unable to compete with traditional currency trading. Second, cybersecurity issues due to attack from hackers. Finally, regulations issue because it is not organized from some countries (Fang, 2022).

Bitcoin, which was founded in 2009, was the first cryptocurrency and is now the most widely traded (Fang, 2022). Satoshi Nakamoto created the currency, which is commonly assumed to be a codename for an individual or group of individuals whose specific identity is unknown. To improve the privacy of Bitcoin transactions, the currency employs a technique known as "Elliptic Curve Cryptography" (Wang et al., 2020). However, Bitcoin is a decentralized digital currency offering lower fees in transactions using secured decentralized authority in Blockchain architecture.

Artificial neural network (ANN) is a supervised machine-learning model utilized in a variety of business and scientific applications (Khuntia & Hiremath, 2019; Li et al., 2020; Smyth & Narayan, 2018; Xiao et al., 2018). The employment of ANNs has emerged in predicting the stock market. The authors in Lv et al. (2020) used the Haar wavelet and Takagi–Sugeno–Kang (TSK) fuzzy rule-based system to forecast stock prices depending on different technical indicators. The model is trained using the Taiwan Stock Exchange market dataset, which has a performance accuracy of up to 99.1%. The authors in Çatık et al. (2020) proposed a fusion-forecasting model of wavelet as a data preparation technique, fuzzy logic, and ANN. The model was built from a stock market dataset gathered during the period from 2005 to 2010. The hybrid behavior of the model indicates reasonable accuracy instead of employing the models independently. The authors in Munandar (2015) also proposed a fuzzy wavelet neural network (FWNN) model for predicting stock prices. The model is evaluated on a daily stock price dataset of 1000 samples that is 90% for training and 10% for testing. The model achieves remarkable results in comparison with other approaches.

The adaptive network-based fuzzy inference system (ANFIS) is a combination of fuzzy and ANN learning algorithms of five layers (Çatık et al., 2020; Geng & Wang, 2010; Khuntia & Hiremath, 2019; Li et al., 2020; Lv et al., 2020; Smyth & Narayan, 2018; Wang et al., 2020; Xiao et al., 2018) and (Fan et al., 2012) that is used in a variety of applications (Nadimi et al., 2010; Wang et al., 2020). The ANFIS model has achieved superior accuracy results in many applications as a forecasting model in comparison to the ANN model independently (Abiyev & Abiyev, 2012; Chang & Fan, 2008; Homayouni & Amiri, 2011; Honghui & Yongqiang, 2012; Munandar, 2015; Sehgal et al., 2014; Septiarini et al., 2016). Therefore, this paper exploits using the ANFIS model in forecasting the fluctuations in the cryptocurrency stock market. We evaluate the Bitcoin as a recent type of cryptocurrency stock market application. *Thus, our contributions is summarized as follows. First, Gathering a cryptocurrency dataset such as Bitcoin that maintains some features and stock price*

as a dependent variable. Second, Evaluating the proposed model using evaluation metrics to reveal the effectiveness of the proposed model.

This study is organized as follows. Materials and methods are explained in Sect. 2. The research design and methodology are discussed in Sect. 3. The empirical results are analyzed in Sect. 4. The conclusions are drawn in Sect. 5.

2 Materials and Methods

This section gives a background of the main concepts used in our study.

2.1 Wavelet Transform Formula

The Wavelet Transform (WT) is a mathematical function that transforms time series data into a time-scale domain. Due to its inherent nature, WT is an appealing solution for non-stationary data, particularly stock market data. Discrete Wavelet Transforms (DWT), Continuous Wavelet Transforms (CWT), and Maximum Overlapping Wavelet Transforms (MOWT) are the three types of WT. In general, these transformations behave the same way. The key difference between DWT and MODWT is that DWT can only be utilized with a certain number of observations (the number of observations should be 2 raised to the power J), but MODWT can handle any size of data. As a result, we'll concentrate on MODWT in this study because of its adaptability (Zhang & Wang, 2012).

WT is essentially an extension of the Fourier Transform (FT) (Adil, 2015), which uses sine and cosine functions. WT satisfies the admission criteria:

$$C_{\varphi} = \int_{0}^{\infty} \varphi(f) \vee \frac{\varphi(t)}{f} df < \infty \tag{1}$$

where $\varphi(f)$ is the FT and a function of frequency f, $\varphi(t)$. The WT is used in many applications such as image analysis and signal processing. It was introduced to overcome the problem of FT, especially when dealing with time, space, or frequency.

There are two types of WT namely the Father wavelet that describes the low-frequency components (smooth data) and the mother wavelet that describes the high-frequency (detailed data) components as shown in Eqs. (2) and (3), with j = 1, 2, 3, …, J in the J-level wavelet decomposition:

$$\phi j, k = 2^{\left(\frac{-j}{2}\right)} \phi\left(t - \frac{2^j k}{2^j}\right) \tag{2}$$

$$\varphi j, k = 2^{\left(\frac{-j}{2}\right)} \varphi\left(t - \frac{2^j k}{2^j}\right) \tag{3}$$

where J denotes the maximum scale sustainable by the number of data points and the two types of wavelets stated above, namely father wavelets and mother wavelets and satisfies:

$$\int \phi(t)dt = 1 \, and \, \int \varphi(t)dt = 0 \tag{4}$$

The general mathematical model is presented in Eq. (5)

$$S_{j,k} = \int \phi_{j,k} f(t)dt, d_{j,k} = \int \varphi_{j,k} f(t)dt, \tag{5}$$

In more details,

$$F(t) = \sum S_{j,k}\phi_{j,k}(t) + \sum d_{j,k}\varphi_{j,k}(t) + \sum d_{j-1,k}\varphi_{j-1,k}(t) + \cdots + \sum d_{1,k}\varphi_{1,k}(t) \tag{6}$$

$$S_j(t) = \sum S_{j,k}\phi_{j,k}(t) \text{ and } D_j(t) = \sum d_{j,k}\phi_{j,k}(t) \tag{7}$$

The WT is used to calculate the approximation coefficient in Eq. (7) where $S_j(t)$ and $D_j(t)$ are introducing the smooth and detailed coefficients, respectively. The detailed coefficients are used to discover the main variations of the original data, whilst the smooth coefficients contain the most relevant aspects of the original data.

WT has a number of well-known transform functions, including Haar, Daubechies (d4), coiflet (c6), Least Asymmetric (LA8), and the best-localized (bl14). The following are the primary characteristics of these functions: (1) Except for the Haar model, the WT functions are arbitrary regular. (2) Except for the Haar model, WT functions do not have explicit expressions. (3) Real numbers are used in WT functions. (4) The scale function, orthogonal analysis, bio-orthogonal analysis, continuous/discrete transformation, accurate reconstruction, and quick algorithm are all WT functions that are orthogonal, compact, and support an arbitrary number of zero moments. (5) The Haar, LA8, and d4 modes are symmetric, although C6 and Bl14 have near symmetry.

2.2 *Autoregressive Integrated Moving-Average Model (ARIMA)*

In time series analysis, the auto-regressive moving average (ARMA) models are used to represent stationary time-series data. A moving average (MA) and an auto-regressive (AR) model are combined in the ARMA model. A time series $\{e_t\}$ is called a white noise (WN) process and $\{Y_t\}$ is called Gaussian process iff for all t, e_t is iid $N\left(0, \sigma^2\right)$. A time series $\{Y_t\}$ is said to follow the ARMA (p, q) model if:

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$$Y_t = \mu + \phi_1 Y_{t-1} + \phi_2 Y_{t-2} \cdots + \phi_p Y_{t-p} + e_t - \theta_1 e_{t-1} - \theta_2 e_{t-2} \cdots - \theta_q e_{t-q} \quad (8)$$

where q and p are non-negative integers, p represents order of AR, q is defined as order of the first MA part, and $\{e_t\}$ is the WN process. An extension of the ordinary ARMA model is the auto-regressive integrated moving-average model (ARIMA (p, d, q)) given by:

$$\phi_p(B)(1 - B)^d Y_t = \theta_0 + \theta_q(B)e_t \quad (9)$$

where p, d and q denote orders of auto-regression, integration (differencing) and moving average, respectively. When $d = 0$, the ARIMA model reduces to the ordinary ARMA model.

2.3 ANFIS Model

The ANFIS model combines the fuzzy logic and artificial neural network into a single model. Its operations consist of forwarding and backward learning algorithms. The forward step consists of five layers. The fuzzy inference system under consideration is supposed to have two inputs (x, y) and one output (z) to simplify the explanations. A standard rule base of fuzzy if–then rules for a first order of Sugeno fuzzy model can be expressed as: If x is A_1 and y is B_1 then $f_1 = p_1 x + q_1 y + r_1$, where p, r, and q are linear output parameters. The ANFIS architecture with two inputs and one output is as shown in Fig. 1.

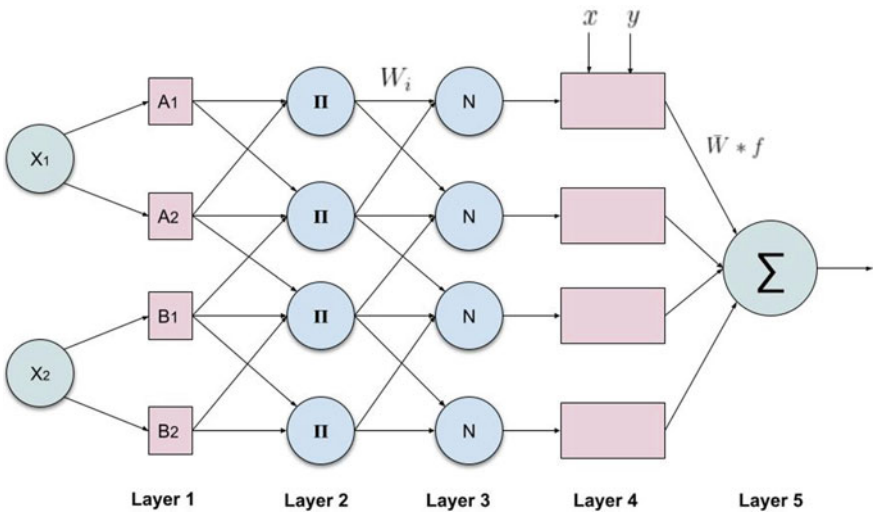

Fig. 1 ANFIS architecture of two inputs and one output with four rules

Layer-1: Every node i in this layer is a square node with a node function.

$$O_{1,i} = \mu_{Ai}(x), \text{for } i = 1, 2, 3 \text{ and } O_{1,i} = \mu_{Bi-3}(y), \text{for } i = 4, 5, 6 \quad (10)$$

where x and y are inputs to node i, and A_i and B_i are linguistic labels for inputs. The $O_{1,i}$ is the membership function of A_i and B_i. Typically, $\mu_{Ai}(x)$ and $\mu_{Bi}(y)$ are selected to be bell-shaped with maximum value of 1 and minimum value of 0, such as $\mu_{Ai}(x)$, $\mu_{Bi-3}(y) = \exp\left(\left(\frac{-(x_i - c_i)}{a_i}\right)^2\right)$, of the set of parameteris a_i, c_i. In this layer, these parameters are referred to as premise parameters. The fuzzification method turns crisp values into linguistic values by utilizing the Gaussian function as the shape of the membership function.

Layer-2: Each node in this layer is a circle node labeled Π that multiplies the incoming signals and sends out the product. For example,

$$O_{2,i} = w_i = \mu_{Ai}(x).\mu_{Bi-3}(y), i = 1, 2, 3, \ldots, 9 \quad (11)$$

The firing strength of a rule is described by each node output. The inference step uses the t-norm operator (AND operator) in this layer.

Layer-3: Each node in this layer is a circle node called N. The i th node measures the ratio of the i th rule firing strength to the sum of all rules firing strengths:

$$O_{3,i} = \overline{w}_i = \frac{w_i}{(w_1 + w_2 + \cdots + w_9)}, i = 1, 2, 3, \ldots, 9 \quad (12)$$

In short, the ratio of the strengths of the rules is calculated in this layer.

Layer-4: Each node i in this layer is a square node with a node function:

$$O_{4,i} = \overline{w}_i.f_i = w_i.(p_i x + q_i y + r_i), i = 1, 2, 3, \ldots, 9 \quad (13)$$

where w_i is the output of layer 3 and $\{p_i, q_i, r_i\}$ is the parameter set. Parameters in this layer are referred to as consequent parameters. In short, the parameters for the consequent parts are measured in this layer.

Layer-5: A circle node called $\sum$ is the single node in this layer that calculates the overall output as the summation of all incoming signals.

$$O_{5,i} = overall\ output = \sum_i \overline{w}_i.f_i = \frac{\sum_i w_i.f_i}{\sum_i w_i} \quad (14)$$

The backward step is an estimation approach that starts with the membership function parameters and ends with the linear equation coefficients. Because the Gaussian function is employed as the membership function in this method, two parameters of this function are optimized: mean and variance. In this step, the parameter learning is done using the least-squares method.

2.4 Accuracy Criteria

We use several types of accuracy criteria: the Mean absolute percentage error (MAPE), the Mean absolute error (MAE), and the Root means squared error (RMSE).

The MAPE criterion is also known as mean absolute percentage deviation (MAPD) that is a measure of prediction accuracy of a forecasting method in statistics. It usually expresses accuracy as a percentage, and is defined as $MAPE = \frac{1}{n}\sum_{t=1}^{n}\left|\frac{X_t - F_t}{X_t}\right|$, where X_t is the actual value and F_t is the forecasted value. The absolute value in this calculation is summed for every forecasted point in time and divided by the number of fitted points. The MAE is recommended for determining an arithmetic average of the absolute errors to measure comparative accuracy of forecasts. It is estimated by $MAE = \frac{1}{n}\sum_{t=1}^{n}|X_t - F_t|$, where the actual value (X_t) minus the forecasted value (F_t).

The RMSE is also known as root-mean-squared deviation (RMSD) that is a frequently used measure of the estimators differences. It measures the average error produced by the model in predicting the outcome for an observation. It is defined as:

$$RMSE = \sqrt{MSE} = \sqrt{\frac{\sum_{i=1}^{n}(actual\ value - predicted\ value)^2}{n}}$$

where n represents the number of observations.

3 Research Design and Methodology

The objective of this research is to first model the closed price data, and then discuss the fluctuations during the historical data issued from BTC that covers the duration from December 2017 to January 2022. In this regards, we have used ANFIS and MODWT models and considered the Haar WT function. The performance is assessed using the accuracy measure.

We have proposed several models to forecast the closed price BTC data. We used MODWT to convert the original data into a time-scale domain. Then we combined the MODWT with the ANFIS model to improve the forecasting accuracy. We studied Haar WT function of MODWT to evaluate our models. Figure 2 illustrates the steps of the MODWT forecasting process.

When the data pattern is very fluctuated, the wavelet process is repeatedly applied. The aim of pre-processing is to minimize the statistical criteria such as Root Mean Squared Error (RMSE) between the signal before and after transformation. The noise in the original data can thus be removed in this way. Significantly, the adaptive noise in the training pattern may reduce the risk of overfitting in the training phase. Thus, we adopt MODWT twice for the pre-processing of the training data in this study.

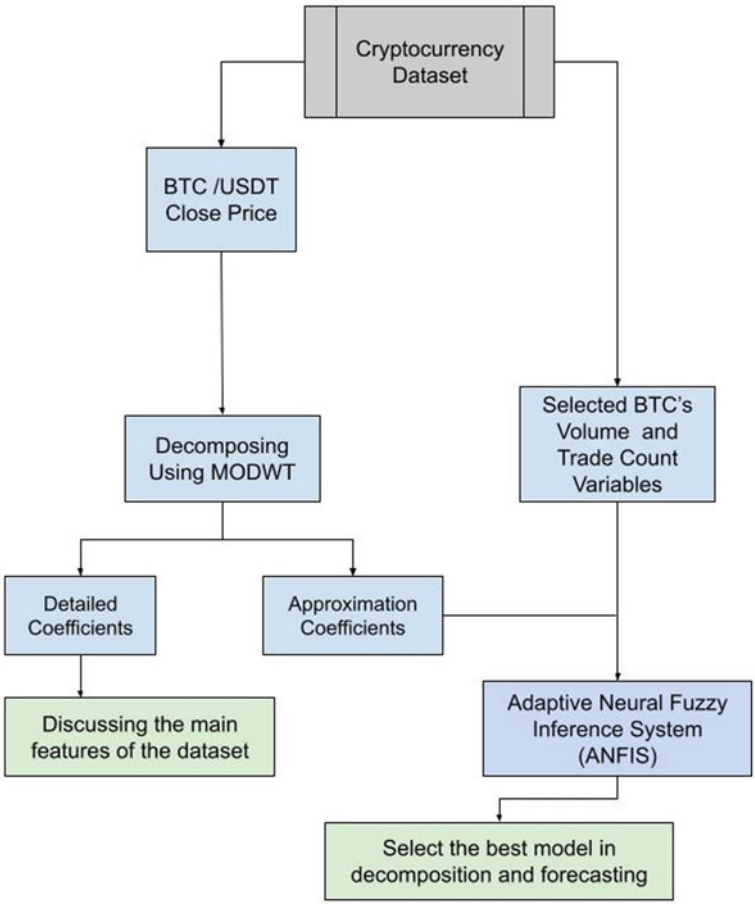

Fig. 2 The flowchart of the MODWT with ANFIS

Further, MODWT converts the data into two sets namely, detail series and approximation series. Since the financial data fluctuates significantly, we have employed these two series because they show good behavior on such data. This makes it easier to anticipate the transformed data with greater accuracy. The MODWT's filtering effect is responsible for these two series' exceptional behavior.

To model the data, we devised the following methodology, which is also shown in Fig. 2. First, the MODWT is used to simulate closed pricing data. The Haar function is then used to dissect the historical return data. Then, using detail series, the variations are recognized and the historical volatility data is examined. The independent variables are chosen in a preprocessing stage based on correlation, causation, and multiple regression. The ANFIS model is then calculated using dependent variables. The ANFIS model is then fitted to the approximation series for forecasting. Finally, using the required criteria, the new technique is compared to the ANFIS model.

Table 1 Descriptive statistic of BTC in cryptocurrency market

	Mean	Std. deviation	Minimum	Maximum	Skewness	Kurtosis
Close price	19200.07	17880.17	3211.72	67525.83	1.16	−0.21
Volume BTC	53858.83	34644.52	1368.15	402201.67	2.66	14.17
Trade-count	828846.24	748577.13	12417.00	6331062.00	1.58	3.41

To ensure a fair comparison and evaluation, we applied 80% of the original data and transformed data to the proposed model first, then select the best performing model, which is then combined with other suggested models for the remaining 20% of the data. This confirms the outstanding performance of our proposed model.

4 Empirical Results

In this section, we present the data used in our study. Then, we highlight the empirical results.

4.1 Data Description

The sample data of closing prices are collected from cryptocurrency market. The day-to-day closing prices of BTC/USDT (where, Tether (often called by its symbol USDT)) were collected from December 2017 until January 2022. The size of observations is 1535. Table 1 shows the descriptive statistic of dataset.

The mean and standard deviation of BTC's close price are 19200.07 and 17880.17, respectively. The minimum and maximum values of BTC's close price are 3211.72 and 67525.83, respectively. The skewness and kurtosis are 1.16 and −0.21. The BTC's volume, mean and standard deviation are 53858.83 and 34644.52 whereas the minimum and maximum values are 1368.15 and 402201.67, respectively. The skewness and kurtosis are 2.66 and 14.17. It should be noted that the mean and standard deviation of trade-count 828846.24 and 748577.13, correspondingly. The minimum and maximum values of trade-count are 12,417 and 6,331,062 whereas the skewness and kurtosis values are 1.58 and 3.41, respectively.

4.2 Endogeneity Issues

In this subsection, we discuss selecting suitable variables by removing multi-collinearity and multiple regression analysis.

Table 2 The correlations between the input variable and the output variables

	LCP	LTC	LV
LCP	1	0.795	−0.852
LTC		1	−0.491
LV			1

4.2.1 Correlation

We deliberately selected independent variables from various other variables, which are eliminated based on certain tests. First, we removed variables as a result of multi-collinearity among independent variables as shown in Table 2. The absence of perfect multi-collinearity, an exact (non-stochastic) linear relationship between two or more independent variables, is generally referred to as no multi-collinearity. We extracted some variables from independent variables according to the strong relation with other independent variables. The correlations between the independent and dependent variables are shown in Table 2. There is a strong correlation between the logarithm of BTC/USDT close price (LCP) with logarithm trade count (LTC) and logarithm volume for BTC (LV) because the percentage of correlation is more than 50%. However, because the correlation between the input variables LV and LTC is less than 50%, there is a weak association.

4.2.2 The Results of Multiple Regressions

Multiple regression is an extension of simple linear regression that is used when the value of a variable must be predicted based on the values of two or more other variables. The dependent variable (output variable (LCP)) is the one that has to be predicted, whereas LTC and LV are the independent variables (input variables) that are utilized to predict LCP. Table 3 shows the results of the multiple regression analysis. The LTC and LV are considerable at 1%. Furthermore, R-square and modified R-square are both around 90%, implying that the independent factors can explain roughly 90% of the dependent variable. The linear regression model is better suited to the results when the F-statistic is 1% significant.

Table 3 The multiple regression

	Estimate	Std. error	t value	Pr(>|t|)
Intercept	−0.028	0.097	−0.289	0.773
LTC	0.457	0.008	54.395	0.000***
LV	−0.709	0.011	−67.06	0.000***
R-square	*0.906*	*F-statistic*	*7417.445*	
Adjusted R-square	*0.906*	*p-value*	*0.000*	

Note "***" 0.001, "**" 0.01, and "*" 0.05

There is a negative relationship between LV and LCP. This indicates that the increase in LV will reduce the LCP in the cryptocurrency market by about 71%. On the other hand, the LTC has a positive relationship with LCP. This implies that the increase in LV will increase the LCP by about 46%. The R-square and adjusted R-square are approximately 90%. Furthermore, F-statistics is significant at a level less than 0.001.

4.3 Results and Discussion

This study examines the LCP of cryptocurrency. It is chosen for different reasons. Cryptocurrency is a digital payment mechanism that does not rely on banks for transaction verification. It's a peer-to-peer payment system that allows anybody, anywhere to send and receive money. Cryptocurrency payments exist purely as digital entries to an online database that identify individual transactions, rather than as physical money that can be carried about and exchanged in the real world. Cryptocurrency is stored in digital wallets. Cryptocurrencies are based on blockchain, a distributed public ledger that keeps track of all transactions that are updated and maintained by currency holders. Furthermore, BTC is an effective indicator of the crypto market in general since it is the largest cryptocurrency by market cap and the rest of the market tends to follow its movements. Therefore, the close price of BTC data is decomposed using MODWT with is Haar function as shown in Fig. 3.

The MODWT based decomposition is an effective approach for revealing variations, magnitudes, and phases of the data. The levels of decomposition can be carried out by the WT using the formula, according to the WT mechanism: $X = TV1 + TW1$ where the original signal is referred to as X. The next component consists of one level of approximation ($TV1$) that shows the plot of the transformed data approximation coefficients. The following parts of $TW1$ reflect the level of detail, whereby $TW1$ is the plot of the first level of the coefficients of detail, so the fluctuation can be explained by this level.

When Bitcoin was first introduced in 2009, it had no value. Its value raised to $0.09 on July 17, 2010. On April 13, 2011, the price of bitcoin climbed again, rising from $1 to a peak of $29.60 on June 7, 2011, a 2.960% rise in three months. Bitcoin's price had fallen below $2.05 by mid-November, following a sharp drop in cryptocurrency markets. By August 15, the next year, the price had risen from $4.85 on May 9 to $13.50. Throughout 2017, Bitcoin's price remained around $1,000 until it crossed $2,000 in mid-May, when it soared to $19,345.49 on December 15. Other institutions began designing cryptocurrencies to compete with Bitcoin as investors, politicians, economists, and scientists took notice. Bitcoin's price meandered laterally during the next two years, with brief bursts of activity. For example, in June 2019, there was a resurgence in price and transaction volume, with prices exceeding $10,000. By mid-December, though, it had decreased to $6,635.84. The economy came to a halt in 2020 owing to the COIVD-19 epidemic, and Bitcoin prices skyrocketed once more. The coin was worth $6,965.72 at the start of the year. Investors' anxieties

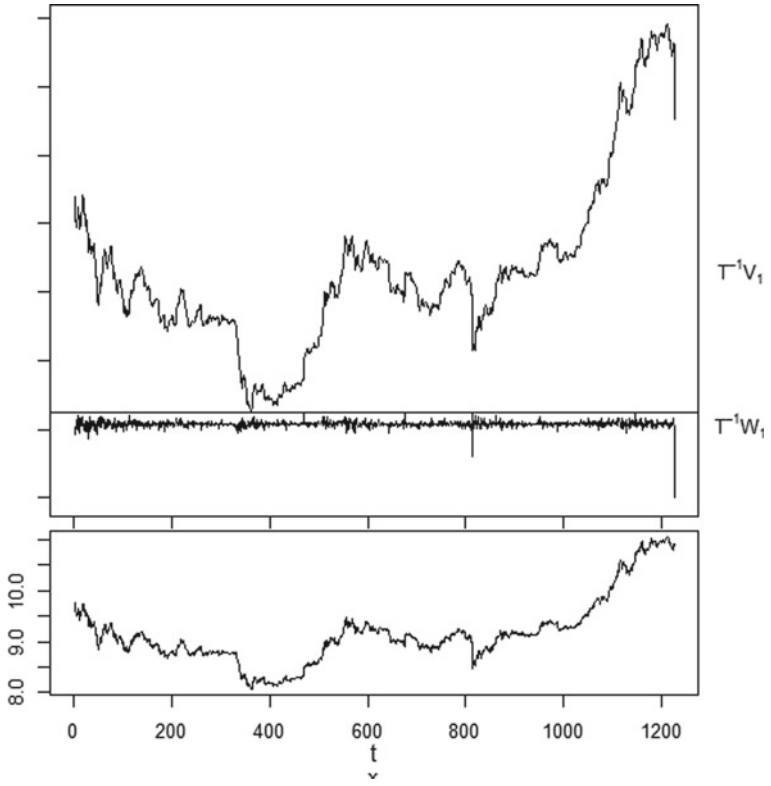

Fig. 3 Decomposing the data using MODWT based on Haar function

about the global economy were increased by the pandemic closure and subsequent government response, hastening Bitcoin's ascent. On November 23, Bitcoin was worth $19,157.16 at the end of the day. Bitcoin's price hit well around $29,000 in December 2020, having risen 416 percent since the beginning of the year.

In 2021, Bitcoin set a new price record in less than a month, reaching $40,000 on January 7, 2021. Bitcoin values achieved new all-time highs of over $60,000 for the first time as Coinbase, a cryptocurrency exchange, went public in mid-April. Bitcoin's price rose even higher as a result of institutional interest, reaching a peak of more than $63,000 on April 12, 2021. Nearly the summer of 2021, prices had plummeted by half, with the lowest being $29,795.55 on July 19. Autumn experienced another bull run in September, with prices reaching $52,693.32 before plunging to around $40,709.59 at the start of 2022.

Table 4 The statistical models for 80% and 20% of dataset

Size	Models	ARIMA	RMSE	MAE	MAPE
80%	Haar	ARIMA (1, 2, 0)	0.0323	0.0203	0.2211
	ARIMA-direct	ARIMA (1, 2, 0)	0.0506	0.0351	0.3823
20%	ANFIS		2.6360	2.6232	32.4777
	ANFIS + WT (Haar)		2.6295	2.6105	32.3071
	ANFIS + ARIMA direct		2.6466	2.6393	32.6862

4.3.1 The Result of ANFIS and Haar Function

The results of the suggested models using the first 80% of the dataset are shown in Table 4. The Haar model provides the original LCP data. Based on a comparison of Haar and ARIMA, the MODWT (Haar) is determined to be the best model, with minimal values of 0.0323, 0.0203, and 0.2211 for RMSE, MAE, and MAPE, respectively.

Forecasting is done utilizing the remaining 20% of the modified and original data for the same suggested models to confirm our findings. We discovered that ARIMA-MODWT (Haar) with ANFIS is the best model because it has the lowest RMSE, MAE, and MAPE-fit values. LCP is employed as an output variable in the training phase, whereas LCT and LV are used as input variables by MODWT (Haar) to build ANFIS and ANFIS + MODWT models.

5 Conclusion

We have proposed a new model called MODWT-Haar-ANFIS. The model is used to forecast the closing price in the cryptocurrency market. We have selected LTC and LV as input values based on correlation and multiple regressions. We found that there is a weak correlation between the input variables ($r = 0.49$). On the other hand, the correlation between LTC and output variable (BTC) is strong ($r = 0.795$). Moreover, the correlation between LV and output variable (BTC) is strong ($r = -0.852$). Furthermore, the multiple regression test is used. Therefore, the input variables are significant at level 0.1%. The output and input variables are collected from cryptocurrency market from December 2017 to January 2022 with 1535 observations. The MODWT-Haar mechanism splits output variable into details coefficient and approximation coefficient. On the other hand, the output variable is split into details coefficient (high fluctuated data) and approximation coefficient (which consists of the main features of data). The approximation coefficient data (MODWT-Haar) are used with input variables to build our model MODWT-Haar-ANFIS. Three statistical tests were used to analyze the MODWT-Haar-ANFIS: root mean squared error (RMSE), mean absolute error (MAE), and mean absolute percentage error (MAPE) (MAPE). Traditional models were compared to the MODWT-Haar-ANFIS model (ARIMA

and ANFIS models). Traditional models are less accurate than the MODWT-Haar-ANFIS. As a result, the new proposed forecasting methodology can be used to other cryptocurrencies as well. Furthermore, this model is powerful enough to optimize corporate operations for a country's economic progress.

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Development of Data Mining Expert System Using Naïve Bayes

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Abstract The consumer spectrum consists of a wide range, including the affluent, middle-income, and low-income. This consumer shows different behaviors or motivations towards choosing clothes. We want to develop a framework for a Sale Recommendation System. These expert System can be helpful for sale persons, fashion designer, promoter, brand manager as well as sponsor of Recommendation System. The study implemented the Data Science approach and techniques to see how reliable Recommendation Systems are and in our selected dataset we have applied different modelling techniques such as KNN, SVM, Bayes Naïve and Decision Tree and fond the NB as the most suitable and practical method of modelling in regard to the accuracy, recall and runtime.

Keywords Data science · Fashion · Style · Sale · Recommendation system

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_134

1 Introduction

In recent years, fashion and dressing sale have found an abstract meaning in the form of start-ups, branding, design of production and representation. Famous brands have earned large sums of money for their business every year by gaining fame by associating and engaging their customers, and in this case, recommendation system from sale person has not been addressed or paid very little attention (Akhtar et al., 2021; Al Ali, 2021; AlHamad et al., 2021, 2022; Ali et al., 2021). The fashion and clothing industry constitutes high share value of active enterprises worldwide and its amount is increasing every day. New marketing ideas such as fast fashion and entrepreneurship campaigns are emerging (Ali et al., 2022; Alnazer et al., 2017; Alnuaimi et al., 2021; Alsharari, 2021; Alshurideh et al., 2022). In the present work, we want to make a decision support system from the data gained on the sales recommendation of several companies in the fashion and clothing industry, with the help of Data Scientific approaches and compare the reliability of our results in the business world. Are these methodologies suitable in the real world? Based on the findings, is it possible to make suggestions to other activists in the fashion and clothing industry who either do not have a recommendation system or have not made a profit from it, so that they can achieve high profitability and effectiveness? Manufacturers and intermediaries of this category of products generally compete in a win–win or offensive strategy (ex. luxury brands) (Alshurideh et al., 2020; Alwan & Alshurideh, 2022; Alzoubi, 2021a, 2021b; Alzoubi et al., 2020a, 2020b, 2022; Sweiss et al., 2021; Tariq et al., 2022). Clothing goods with customs exemptions are consumer goods and with a small investment can be distributed through the different channel and of course, except for brands that only sell their goods through reputable agencies, specialty stores and branches in hypermarkets and stores (Hanaysha et al., 2021a, 2021b; Joghee et al., 2020; Kashif et al., 2021; Khan, 2021; Lee & Ahmed, 2021). The seller brings his goods mainly to big cities through free trade zones and enters the market and delivers them to the location of his store at different prices at different prices to the consumer. Here, consumer behavior and the tastes of the upper middle class will be considered (Al Kurdi & Alshurideh, 2021; Al Kurdi et al., 2020; Alshurideh, 2019; Alshurideh et al., 2019). Taste or the same behavior of buying fashion and clothing in the traditional middle class mostly follows a single logic in the type of purchase and in the affluent class who have emotional behavior is at very high prices and is sold at the maximum prices in the market (Lee et al., 2022a, 2022b; Mehmood, 2021; Mehmood et al., 2019; Miller, 2021; Mondol, 2021; Obaid, 2021; Radwan & Farouk, 2021; Shamout et al., 2022).

2 Dataset Description

2.1 Preprocessing

First, before examining the size of the our data, we must have a description that refer to UCI repository (Afifi et al., 2020; Al Batayneh et al., 2021; Ali et al., 2021; Alzoubi et al., 2021a, 2021b; Ghazal, 2021; Ghazal et al., 2021a, 2021b, 2021c, 2021d), and because in this study recommendation system is considered independently, we must determine the number of counts and their description to each attribute. From the definition and understanding of this research we have used two filters for data cleansing namely RemovePercentage and AddNoise. Out of the number of samples in the dataset, which was 500, only 200 questionnaires were completely recommended. Therefore, considering dataset as a whole, it can be estimated to generate a 1/1 out of 2/3 ratio among recommendation to constitute 238 versus 238 rebalancing (Fig. 1).

Of the population selected for analysis, rating was with the most skewness in grade between 4 or 5. And price was major in Low and Average (middle class) (Fig. 2).

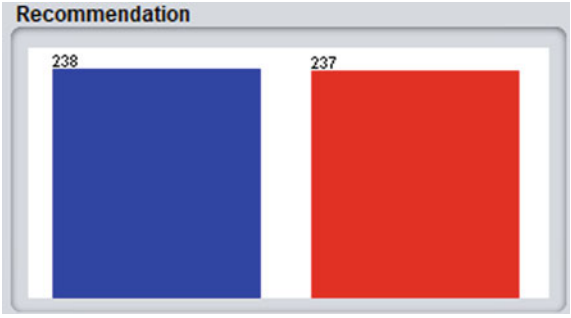

Fig. 1 Recommendation class

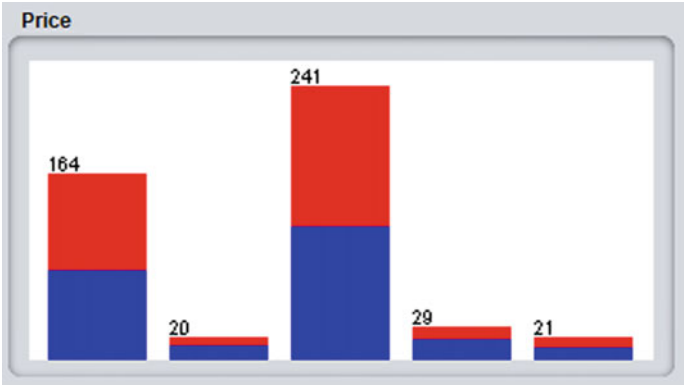

Fig. 2 Price marketing criteria

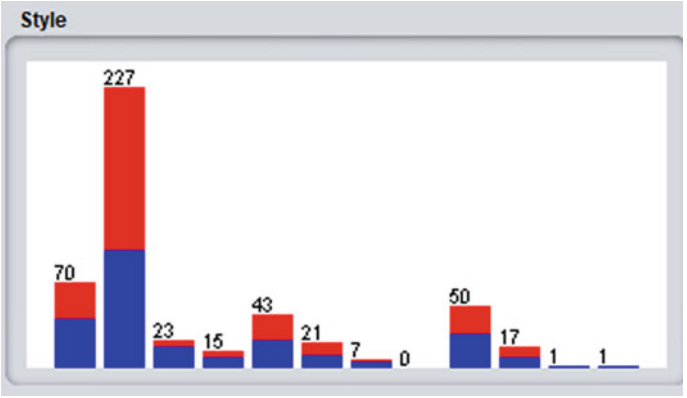

Fig. 3 Style distribution

According to the information on style and size one can guess that population were young aged and female which wear Casual, sexy and party style costume. The following figure diagram shows this information graphically (Fig. 3).

2.2 Attribute Selection

Subset evaluation is a vital step in the Data Science techniques. In our case Weka selected 39 subset and searched for the best set with 74.3% Merit of best subset found (Ghazal et al., 2013, 2021a, 2021b, 2021c, 2021d; Kalra et al., 2020; Khan et al., 2021a, 2021b). This resulted in the selection of seven attributes as shown in the following:

- Style
- Price
- Rating
- Size
- Season
- NeckLine
- Material.

3 Methodology

Java-based Weka version 3.9 was suited for our application in this report (Weka Application manual). We have used python 3.7 panda library to see those infographics. The details of results of coding within the description of all attributes are attached in the Appendix.

```
import pandas as pd
data = pd.read_csv("DressData.csv")
print(data.head(4))
data.info()
data.describe()
data
```

4 Modelling

After the importing the dataset into the Weka, modelling techniques utilised and was calibrated with the usage of hyper-parameter tuning were k-nearest neighbors (kNN), (the number of neighbors is equal to 4) Neural Network (NN), (the batch size is equal to 100) and Naïve Bayes (NB) (Alzoubi & Ahmed, 2019; Alzoubi & Aziz, 2021; Alzoubi & Yanamandra, 2020; Alzoubi et al., 2020a, 2020b, 2021a, 2021b).

5 Results

Table 1 shows the result of accuracy (Recall for the danger of overfitting), F-Measure and Kappa statistics.

Table 1 Data scientific result performed in Weka

Attribute Selection	Classifier	F-measure	Kappa	Recall (%)	Accuracy (%)
12	Bayes Naïve (NB)	60.9%	0.1931	61.0	61.8
	k-Nearest Neighbors (IBk)	50.12%	−0.002	50.8	50.6
	Multilayer Perceptron (NNs)	53.9%	0.0305	53.2	53.2
9	Bayes Naïve (NB)	52.2%	0.0441	52.2	52.21
	k-Nearest Neighbors (IBk)	49.7%	0.0324	51.6	51.57
	Multilayer Perceptron (NNs)	47.7%	−0.044	47.8	47.7
6	Bayes Naïve (NB)	63.6%	0.2486	64.4	64.4
	k-Nearest Neighbors (IBk)	57.2	0.1215	57.2	57.2
	Multilayer Perceptron (NNs)	53.2%	0.0691	58.4	58.4

The Bayes Naïve model estimation is based on the Bayes Probability theory and outperformed other two techniques on all model efficiency and also runtime (Lee et al., 2021; Matloob et al., 2021; Naqvi et al., 2021; Rehman et al., 2021; Suleman et al., 2021). The effect of attribute reduction performed on preprocessing stage can be seen that 3 to 4 attributes are indifferent for our prediction models. Anyway, the precision was not intended to be either/or but rather the practically developed model with more than 60% accuracy. In the following table the confusion matrix is also indicated. The number of correct classified instances for "Yes" 100 and "No" was equal to 222.

```
=== Confusion Matrix ===
  a   b   <-- classified as
100 110 |   a = Yes
 68 222 |   b = No
```

6 Discussion

Generally, for retailers or clothing stores, this result has less external consequences, but the point of view is very important due to the importance of feasibility of designing of such smart system that can capture the customer sense and interaction with the customer. It is important for any brand as a beneficiary of a recommendation system to take advantage of opportunities and generally use chances and prevent failures in the competitive market, which will be created by differentiating in the mind of the customer (Aziz & Aftab, 2021; Cruz, 2021; Eli, 2021; Farouk, 2021; Ghazal et al., 2021a, 2021b, 2021c, 2021d; Guergov & Radwan, 2021; Hamadneh et al., 2021).

7 Conclusion

We have developed a framework that can model the sale recommendation for better communication between clients. We have firstly extracted the dataset from the UCI and then imported the data for the preprocessing into weka and python. The data was cleansed at the forst step by the filtering tools embedded and was balanced for the danger of overfitting. Then five different machine learning tools was implemented in the dataset to tune the hyper-parameter which resulted into more than 10% improvement in the results. With the information learned from the modeling we understood that with the possibility of neat 65% we can use such system.

Appendix [Python Code with Outputs]

```
import pandas as pd
 In [2]:
data = pd.read_csv("DressData.csv")
 In [3]:
print(data.head(4))
     Style    Price Rating Size  Season NeckLine SleeveLength Waistline  \
0     Sexy      Low    4.6    M  Summer   O-neck   Sleeveless    Empire
1   Casual      Low      ?    L  Summer   O-neck        Petal   Natural
2  Vintage     High      ?    L  Autumn   O-neck         Full   Natural
3    Brief  Average    4.6    L  Spring   O-neck         Full   Natural

     Material  Decoration Pattern Type Recommendation
0           ?     Ruffles       Animal            Yes
1  Microfiber     Ruffles       Animal             No
2    Polyster         NaN        Print             No
3        Silk  Embroidary        Print            Yes
 In [9]:
data.info()
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 500 entries, 0 to 499
Data columns (total 12 columns):
 #   Column          Non-Null Count  Dtype
---  ------          --------------  -----
 0   Style           500 non-null    object
 1   Price           500 non-null    object
 2   Rating          500 non-null    object
 3   Size            500 non-null    object
 4   Season          500 non-null    object
 5   NeckLine        500 non-null    object
 6   SleeveLength    500 non-null    object
 7   Waistline       500 non-null    object
 8   Material        500 non-null    object
 9   Decoration      262 non-null    object
 10  Pattern Type    500 non-null    object
 11  Recommendation  500 non-null    object
dtypes: object(12)
memory usage: 47.0+ KB
 In [11]:
data.describe()
 Out[11]:
```

	Style	Price	Rating	Size	Season	NeckLine	SleeveLength	Waistline	Material	Decoration	Pattern Type	Recommendation
count	500	500	500	500	500	500	500	500	500	262	500	500
unique	12	6	17	5	5	16	10	5	20	23	14	2
top	Casual	Average	?	M	Summer	O-neck	Sleeveless	Natural	Cotton	Lace	Solid	No
freq	232	252	120	177	160	271	232	304	152	70	203	290

Data Describe
Out [11]:

	Style	Price	Rating	Size	Season	NeckLine	SleeveLength	Waistline	Material	Decoration	Pattern Type	Recommendation
count	500	500	500	500	500	500	500	500	500	262	500	500
unique	12	6	17	5	5	16	10	5	20	23	14	2
top	Casual	Average	?	M	Summer	O-neck	Sleeveless	Natural	Cotton	Lace	Solid	No
freq	232	252	120	177	160	271	232	304	152	70	203	290

In [21]:
data
Out[21]:

	Style	Price	Rating	Size	Season	NeckLine	SleeveLength	Waistline	Material	Decoration	Pattern Type	Recommendation
0	Sexy	Low	4.6	M	Summer	O-neck	Sleeveless	Empire	?	Ruffles	Animal	Yes
1	Casual	Low	?	L	Summer	O-neck	Petal	Natural	Microfiber	Ruffles	Animal	No
2	Vintage	High	?	L	Autumn	O-neck	Full	Natural	Polyster	NaN	Print	No
3	Brief	Average	4.6	L	Spring	O-neck	Full	Natural	Silk	Embroidary	Print	Yes
4	Cute	Low	4.5	M	Summer	O-neck	Butterfly	Natural	Chiffon	Bow	Dot	No
...	...	...	...	...	...	...	...	...	...	...	...	...
495	Casual	Low	4.7	M	Spring	O-neck	Full	Natural	Polyster	NaN	Solid	Yes
496	Sexy	Low	4.3	Free	Summer	O-neck	Full	Empire	Cotton	NaN	?	No
497	Casual	Average	4.7	M	Summer	V-neck	Full	Empire	Cotton	Lace	Solid	Yes
498	Casual	Average	4.6	L	Winter	Boat-neck	Sleeveless	Empire	Silk	Applique	Print	Yes
499	Casual	Low	4.4	Free	Summer	V-neck	Short	Empire	Cotton	Lace	Solid	No

[1] 500 rows × 12 columns

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Does Strategic Change Mediate the Relationship Between Total Quality Management and Organizational Culture

Enass Khalil Alquqa, Bader Obeidat, and Muhammad Turki Alshurideh

Abstract The study conducts an empirical analysis of the relationship between total quality management (TQM) practices, with the organizational culture (OC) Cameron and Quinn (Diagnosing and changing organizational culture: Based on the competing values framework, John Wiley & Sons, 2011) model which was divided into four dimensions: leadership supportive, customer focus, strategic planning, and workforce focus. In addition, the study evaluates the mediating role of strategic change (SCH), between organizational culture (OC) and total quality management (TQM). The study uses data obtained from a survey of 341 respondents by using google form online from the employees of the Emirates Post Group (EPG), which is considered as one of the government-owned agencies that controls the logistics business in the UAE, Dubai. The result of the study revealed that strategic change has a direct impact on the TQM practices. In addition to that, the strategic change can be explained as a partial mediator in the relationship between organizational culture variables and TQM practices. It also found that there is a positive and significant effect of organizational culture on strategic change. This study makes a novel contribution by offering a detailed and deeper understanding of the relationship between Organizational culture, strategic change, and total quality management. According to the results, the study recommended that future studies might investigate if other possible mediating variables may also mediate whatever totally or partially the effect of the relationship between TQM and organizational culture.

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_135

Keywords Total Quality Management · Organizational culture · Organizational change

1 Introduction

In recent years, the TQM has directly contributed to the increased competition potential of most institutions and remains at the forefront of expanding changes in the economic, political, and administrative systems (Almaraz, 1994; Cao et al., 2000; Duck, 1993). The current global pandemic of the COVID-19 problem is the most visible illustration of the catastrophe which has unexpectedly struck the world and produced catastrophic change at the economic, political, and social level (Baldwin & Mauro, 2020). Numerous changes also occur at the local and global level to systems and legislation. Such changes demand a flexible, quick response to all the factors, including those at the strategic level, which encompass all the administrative procedures of the organization, that have altered on many levels (Balogun & Johnson, 2005). To encourage change, the organization's culture must be considered, based on the strong conviction of the employees at this institution that change is important and that they feel they are part of the organization, given its role in achieving directional changes requiring speed, preciseness, and quality of employment (Cameron & Quinn, 2011; Denison, 1990). Global rivalry encouraged companies to concentrate more on their clients (Lindquist, 2006). Consumers want items of the highest quality. The focus of the firm is on continual improvement and quality of production and product shipment for customers, with most companies modifying the whole quality management system for the organization and production structure. Total management of quality is crucial to the corporate culture and impacts all areas of employee performance. Every part of the performance of its employees must be carried out to achieve the objective of staff who are able to satisfy excellent customer demands (Prajogo & Sohal, 2006). Through distinguishing its goods and developing a competitive market position, companies have adopted TQM to enhance their company's success. by developing an adequate climate, corporate culture may truly influence company and business success (Cadden et al., 2013). Therefore, the study examined the relationship between the three elements—OC, TQM, and SCH, which are crucial to gain competitive advantage in any company. Additionally, the study has been investigated the relationship between the dimensions of (OC) in the Emirates Post Group and the extent to which (TQM) practices are used, as well as the role of strategic change (SCH) in mediating the relationship between (OC) and (TQM).

2 Importance of the Research

The study investigated the relationship between strategic change (cultural, hierarchical, and human resources); organizational culture (in terms of clan and hierarchy;

external environment: adhocracy and the market) (Cameron & Quinn, 2011). In addition, TQM (customer focus, strategic planning, and workforce focus on terms of leadership support). The point of consideration is that the relationships between these three groups of variables must be investigated, since there are discrepancies in recognizing such relations, as the literature has shown the connection between TQM with the culture and performance of organizations (Baird et al., 2011; Cheng & Liu, 2007; Valmohammadi & Roshanzamir, 2015). Furthermore, few studies have addressed TQM's relationship to strategic change (Huq, 2005; Leonard & McAdam, 2001). Thus, it is crucial to examine the impact of TQM practices on the relationship between strategic change and organizational culture.

3 Problem Statement

The role of management in institutions emerges increasing the extent of awareness of employees to change (Shin et al., 2012). Given the paucity of studies in the Middle East that are concerned with the organizational culture of the institution and the indicators of comprehensive quality and aspects of strategic change. The researchers first discussed the theoretical framework for those aspects that relied on previous studies in this field, then targeted a field framework to analyze the impact and relationship between the three variables: organizational culture, strategy change, and Total quality management (Cameron & Quinn, 2011; Haffar et al., 2013). Therefore, the study investigates the nature of the relationship between the three variables: total quality management, organizational culture, and strategic change management, using which some of the assumptions have been statistically tested in the Emirates Post Group (EPG), which is considered as one of the government-owned agencies that controls the logistics business and has been profitable for over 45 years. They lived through a period of tranquility during which the Emirate's post was safe. When compared to the previous year, in 2019, they lost 41% of their profits. As a result, if they are to recover and keep their market position, they must halt and make the required modifications. There are numerous barriers to overcome, a lot of misused resources, and a heavy burden on the organization. Rejoining the market will not be easy, as there are many logistic competitors where only the strong survive. In this case, we will discuss empirically the impact of the organizational culture of the organization and TQM on the mediation of strategic change.

The study focused on the independent variable total quality management with its indicators and its impact on the change strategy, as well as quality management as an independent variable and its impact on change strategies. It also focused on quality management indicators as an intermediate variable between organizational culture and strategic change.

4 Goals and Objectives

Accordingly, the importance of the study is in determining the relationship between organizational culture, strategic change, and total quality management when it comes to defining the research problem. Moreover, determine whether strategy change plays as a mediator between organizational culture and total quality management. To achieve the following goals:

1. To specify the level of TQM indicators, Strategic Change, and Organizational Change.
2. To investigate the relationship between Organization Culture (OC), Strategic Change (SCH and total quality management (TQM).
3. To examine strategic change as a mediator between (OC) and (TQM).

5 Purpose of This Research

Using empirical data collected from the emirates post group, this study attempts to achieve two primary goals. First, it aims to discuss the association between OC, strategic change, and total quality management. Secondly, to analyze the appropriateness of strategic change a mediation of the relationship between TQM and OC.

The study consists of four parts. The first focused on the general framework and the theoretical side and previous studies that dealt with all research variables and through which the research hypotheses were defined, which some considered on a relationship between organizational culture and strategic change (Abuhashesh et al., 2021; Al-bawaia et al., 2022; Alshurideh et al., 2021a; Choi & Ruona, 2011; Hamadneh et al., 2021; Heracleous & Langham, 1996; Johnson, 1992; Odeh et al., 2021). While the other considerations on the relationship between SCH, TQM and OC (Fares, 2017). The second part focused on the method of data collection and the mechanism of data analysis and determining the study population, while the fourth part dealt with several aspects. Moreover, the study laid the groundwork for future research to explore and extend the connection between Total quality management, organizational culture, and strategic change.

6 Research Questions

There are valuable explanations to investigate the relationship between (TQM), organizational culture (OC), and strategic change of the organization. The study aims to answer the following questions considering defining the relationship between organizational culture, strategic change, and total quality management:

1. What is the impact of Organizational Cultures (OC) on Strategic Change (SCH) for the employees at the emirates post group?
2. What is the impact of strategic change on total quality management for the employees at the emirates post group?
3. What is the impact of Organizational Culture (OC) on total quality management for the employees at the emirates post group?
4. Does the strategic change (SCH) mediate the relationship between the (OC) and (TQM) for the employees at the emirates post group?

7 Literature Review and Hypotheses Development

Total Quality Management Concepts

Different definitions have led to various interpretations of TQM, Persico (Persico, 1989) argue that TQM is an organizational culture approach which includes employees in numerous business areas as well as the continuous improvement in output through cooperation to achieve the organization's goals. The credit for TQM since 1950 is given to scientists in the United States, such as Edward Goran and Philip Crosby. Juran and Deming prefer to employ TQM measurement by using statistical techniques. While Crosby and Free (1979) did not accept statistical quality,14 actions have been taken to increase quality (Deming & Edwards, 1982). TQM has also been the main reason for the achievement of profitability and sustainability for small and big businesses in recent years. Ciampa (1992) described TQM as an organizational effort to build a sustainable environment where employees continuously enhance their customer satisfaction delivery capacity. In addition, an orderly manner to ensure the fluidity of planned operations is an efficient way to prevent problems, improve good conduct and apply management strategies effectively. Furthermore, Ciampa noted that an organization maintaining the flow of an organization's planned operations is an efficient approach to averting problems, improving good conduct, and making optimal use of management strategies. TQM also offers an organizational approach to building and developing a productive atmosphere in which employees consistently increase their ability to supply value-added products and services on demand. It is a commitment to meet client expectations at the best price, through improved performance.

Organizational Culture (OC): Organizational culture is defined as the general way that people share behaviour, standards, and attitudes and influences the organization's actions, practices, and other values that can readily be absorbed. Therefore, culture is distinguished factors between one organization and another (Schein, 1985). Organizational culture is also a process that aims to improve ways and techniques for reducing workplace conflict and barriers (Moorhead & Griffin, 1989). Furthermore, it is seen as a set of shared fundamental assumptions discovered and formed by a group of individuals in the same context.

Strategic Change (SCH): The study investigates some of the theoretical groundwork for change and, as a result, analyzes how academics are approaching the topic

of organizational culture and total quality management in their studies. In the public and private sectors, the pace of change has recently increased considerably. And it is expected to become much more extreme in a highly competitive world where all businesses will be forced to compete for survival in a new era of "intense competition" (Aupperle & Karimalis, 2001). Researchers propose many elements of strategic change concepts and apply them in various ways, therefore there is no precise or single notion for each one. In terms of dealing with change, the current societal situation is unparalleled. Organizations have accepted the theory that if they want to survive, they must adapt for many years since the industrial revolution (Beer & Nohria, 2000). In general, if people have different interests and values, the change will not be properly implemented (Jackson, 1995). To attain the aim of greater effectiveness based on intellectual ability rather than physical assets, organizations must modify the way they engage with their people (Jarrar & Aspinwall, 1999). Furthermore, the strategy lays out defined objectives, outlines activities to attain them, and allocates resources to carry them out. In addition, when the firm adapts or competes in its environment, a strategy is created as an operational pattern (Alkhafaji & Nelson, 2013). Whereas the operations of the strategy include strategic thinking and strategic planning (Pfeffer & Salancik, 2003). Also, from the perspective of Max Mckeown (2011) the strategy is to draw the future of the organizations and ensure success for the long term (Hill et al., 2014). Strategic change is considered essential for maintaining competitive advantage and long-term organizational sustainability. However, over the last 5 years, Google Scholar has published approximately (791,000) papers on "strategic change" address.

Organizational culture (OC) on strategic change (SCH) context

Cameron and Quinn (2011), Johnson (1992), Heracleous and Langham (1996), Choi and Ruona (2011), Henry (2008), Ashal et al. (2021) studies consider that there is a relationship between organizational culture and strategic change Table 1 summarizes the view of researcher on organizational culture effects on strategic change based on the previous discussion. The study Hypothesize that ***H1*** organizational culture positively impacts strategic change.

Strategic change (SCH) impacts on total quality management (TQM)

Total quality management seeks methods to enhance quality on a continuous basis. There are three criteria or questions that a company should examine when determining whether a change is required: Will the change improve overall consumer satisfaction? Is the change allowing the business and the client to get outcomes more quickly? Also, does the concept help the firm make better use of its resources? If you responded yes to any of these questions, you should adopt the concept to enhance overall organizational and product quality. Several studies, such as (Dutton & Duncan, 1987; Zeffane, 1996), have underlined the importance of culture within the framework of strategic change.

Thus, the second hypotheses are focused on investigating the relationship between strategic change and total quality management TQM.

H2. Strategic change positively impacts total quality management.

Table 1 Organizational culture effect on strategic change

Research	Effects
Henry (2008)	Culture is more powerful than anything else in business, thus every suggestion for change, whatever its nature, must always fit into the unique kind of culture that exists in the company if it is to succeed
Jones et al. (2005)	The employees of organizations that deal with the group's values and norms feel that by participating in a successful change process, they will gain advantages such as awards or promotions. Therefore, it will improve change awareness
Zammuto et al. (2000)	Organizations that follow a centralized structure with a bureaucracy culture and hierarchy, on the other hand, do not foster creativity and innovation; instead, they oppose change. As a result, the participants develop a negative attitude towards the change process
Cameron and Quinn (2011)	Leaders of companies are more likely to be positive about recommended improvements since they expect their firm to not begin or enforce any changes that may negatively impact their employees. This is due to the company's focus on internal employees, which emphasizes the long-term benefits of human capital and places a high value on boosting morale

The relationship between TQM, OC, and SCH

Various studies have been conducted on the relationship between Total Quality Management and organizational culture, with the conclusion that some businesses have failed to adopt because the application process is culturally neglected (Dale & Cooper, 1992). Furthermore, numerous research has claimed the connection or effect of organizational culture (OC) and total quality management (TQM), (Heracleous & Langham, 1996; Rad, 2006). While few have looked at TQM's empirical mediation role in the relationship between change methods and organizational culture. Table 2 highlighted the literature on the factors' mediating function in total quality management, as well as their relationships with other variables.

Therefore, according to the previous discussion, the hypotheses below has been formulated:

- *H3*. organizational culture positively impacts TQM.
- *H4*. Strategic change (SCH) partially mediates the relationship between OC and TQM.

8 Research Methodology

When this study aims to analyze the relationship between three variables, total quality management (TQM), organizational culture (OC), and strategic change (SCH), the analysis is descriptive, organization culture in the empirical analytics model is

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Table 2 The factors' mediating function in total quality management

Research	Effects
Cao et al. (2000)	refers to the assessment of multiple functional areas of TQM as well as strategic change in response to changes in organizational procedures, changes in hierarchical structure and frameworks, and changes in beliefs, norms, and actions related to the distribution of authority and personal rules and procedures
Cameron and Quinn (2011)	Leaders of companies are more likely to be positive about recommended improvements since they expect their firm to not begin or enforce any changes that may negatively impact their employees. This is due to the company's focus on internal employees, which emphasizes the long-term benefits of human capital and places a high value on boosting morale
Haffar et al. (2013)	Investigated the mediation role of total quality management as a possible mechanism through which organizational culture influences change tactics empirically. The findings of this study supported the idea that IRFC plays a mediating role in the relationship between OC and TQM. This contributes to elucidating the connections between OC and TQM implementation
Heracleous and Langham (1996)	Developed a set of three factors to identify the strategic change mediation concept between knowledge and TQM, the study discovered that strategic change mediates the relationship between knowledge management procedures and total quality management indicators
Dutton and Duncan (1987)	Created a framework for how leaders understand strategic concerns for the creation of effective change that helps managers to forecast how members will respond to a changing environment by emphasizing the systematic influence of two variables: the organizational structure and its resources
Demirbag et al. (2006)	Found a positive link between TQM and non-financial SMEs' performance, and a weak relationship between TQM and SMEs' financial performance. Furthermore, there is a mediating effect of SME non-financial performance on TQM practices
Mahmud and Hilmi (2014)	Found that TQM supported both SMEs' performance and organizational learning. Furthermore, culture has an indirect positive impact on total quality management. While (Cao et al., 2000) refers to the assessment of multiple functional areas of TQM as well as strategic change in response to changes in organizational procedures, changes in hierarchical structure and frameworks, and changes in beliefs, norms, and actions related to the distribution of authority and personal rules and procedures

known as the independent variable, while the strategic change as mediate and second independent variable, whereas TQM considered as the dependent variable.

In this study, a questionnaire-based tool was used to collect data, by using online google Microsoft form. 18 questions for evaluating TQM, 18 questions for organizational culture, and 16 questions for strategic change were considered on a Likert scale of 5 points. From which the criteria for evaluating TQM and organizational culture are provided by Cameron and Quinn (2011), Valmohammadi and Roshanzamir (2015) which OC based on the internal and external environment including clan culture, hierarchy, adhocracy, and consumer culture. TQM was also identified based on Cameron and Quinn (2011), contingent on his model, which was divided into four dimensions: leadership supportive, customer focus, strategic planning, and workforce focus. For the evaluation of strategic change (SCH), based on the questionnaire in Fares' research thesis, (Fares, 2017) which included three dimensions: organizational culture, hierarchy, and human resource.

The scope of the research

Emirates post group—Dubai plans for long-term preparation for its two divisions of E documents services and its branches, and Wall Street exchange centers. Currently, they provide high-quality services in the postal division starting from domestic mailing to global shipping, with routes of express mailing. They are continuously developing their services and seeking new solutions for their deliveries being motivated by the growing number of customers and public expectations from the corporation. One of the ideas they came up with is the one-stop-shop for post offices. Additionally, the corporation facilitates financial solutions for both government and private sectors for services like payment of bills, banking, and travelling.

Measurement and Tools

Validity and Reliability

The study used three reliable and valid tools from previous research to develop the questionnaire and methods to achieve the main goals and objectives of this article. The valid and reliable tools developed by Cameron and Quinn (2011) were constructed to determine the level of TQM and organizational culture in the Emirates Group Post (EPG). While measuring the valid and reliable of strategic change in the EPG via the tools developed by the study of Fares (2017). The study has used Cronbach alpha to measure and estimate the degree of the internal consistency of each construct. Table 3 shows that all scales have high reliability and values of Cronbach's alpha derived for the constructs ranging from 64.0 to 92.4. We assessed the construct validity of each construct by using SPSS factor analyses (Samson & Terziovski, 1999). The study result shows in Table 3 that the Cronbach alpha for 16 items of strategic change (SCH) ($\alpha = 91.6$) highly reliable, while the Cronbach alpha for 18 Total Quality Management (TQM) ($\alpha = 92.3$) highly reliable, and the Organizational Culture for 18 Items (OC) ($\alpha = 88.3$) are also highly reliable. Moreover, the study used Pearson correlation, see Table 4. In addition to that, the experts assessed the construct validity. The population includes all the staff in the Emirates post in

Table 3 The variables of the study and Test of reliability-results of factor and reliability analysis

Variables	Items	No. item	Cronbach's alpha
Strategic change	Organizational culture	5	80.2
	Organizational hierarchy	4	79.4
	Human resource	7	91.2
	Total	16	91.6
Total quality management	Leadership supportive	5	86.5
	Customer focus	4	68.1
	Strategic planning	4	92.4
	Workforce focus	5	83.9
	Total	18	92.3
Organizational culture	Clan	5	80.8
	Hierarchy culture	4	64.0
	Adhocracy culture	5	76.4
	Market culture	4	76.8
	Total	18	88.3

Dubai-2020, the total number of employees in person is 2000. The questionnaire was circulated online by using 1000 people in stratified random sampling. 341(198 male, 143 female) Questionnaires were returned. Were chosen and statistically analyzed. Different statistical methods were used for testing the conceptual model such as the Pearson correlation for testing the relations between variables and structural equation modelling for testing the fitness of the model (Table 4).

Testing the study Hypotheses

A series of regression analyses were performed to investigate the proposed relationships among TQM practices, OC, and strategic change (SCH).

From the correlation between the four factor's scores, there is evidence to support convergent validity.

Convergent validity was demonstrated by the positive significant correlation between the four factors (p-value = 0.01). In addition, inspection of the Table 4 reveals the significant correlation between the three factors which r ranging between (940**–732**) hence no item was deleted. As well as the Table 4 reveals the significant correlation between four factors which r ranging between (0.868**–0.456**).

In addition to that, the validity indicators of the tools were extracted by checking the correlation of each item with the dimension, to which it belongs, as well as the

Table 4 Internal context validity by using person correlation

	SCH3	SCH1	SCH2	SCH	
SCH3	1				
SCH1	0.816**	1			
SCH2	0.732**	0.795**	1		
SCH	0.940**	0.937**	0.891**	1	
	TQM1	TQM2	TQM3	TQM4	TQM
TQM1	1				
TQM2	0.863**	1			
TQM3	0.868**	0.865**	1		
TQM4	0.484**	0.456**	0.479**	1	
TQM	0.855**	0.834**	0.852**	0.840**	1
	OC1	OC2	OC3	OC4	OC
OC1	1				
OC2	0.543**	1			
OC3	0.613**	0.506**	1		
OC4	722**	450**	0.720**	1	
OC	886**	752**	0.839**	0.851**	1

correlation of each dimension with the total degree of the scale and the correlation of dimensions with each other.

Descriptive Statistics

Table 5 shows the mean score of organizational culture (OC), TQM, and strategic change. According to the value of mean and standard deviation SD, it is clear in a natural value.

Direct effect

Multiple regression analysis was used to test the direct effect of organizational culture (OC) on Strategic change (SCH) practices as Table 6 (Model1) shows, Clan ($\beta = 0.823$, $P < 0.001$), adhocracy culture ($\beta = 0\ .849$, $P < 0.001$), Hierarchy culture ($\beta = 0.573$, $P < 0.001$), Market culture ($\beta = 0.748$, $P < 0.001$) have positive and significant effects on SCH. in addition to that Table 6 shows that organizational culture (OC) ($\beta = 0.902$, $P < 0.001$) have positive and significant effects on strategic change (SCH). The result strongly supports the study hypotheses *H1*.

Multiple regression analysis was conducted to evaluate the influence of strategic change on TQM. The result in Table 6 (Model2) show that strategic change ($\beta = 0.784$, $P < 0.001$, $R^2 = 0\ .614$), organizational culture ($\beta = 0.663$, $P < 0.001$, $R^2 = 0.465$), and human resource ($\beta = 0.822$, $P < 0.001$, $R^2 = 0\ .676$) have a positive and significant effect on total quality management TQM, whereas the effect of hierarchy ($\beta = 0.525$, $P < 0.001$, $R^2 = 0.276$) affect less than other factors on TQM. In general, the result in Model2 supports *H2*.

Table 5 Mean score of SCH, TQM, and OC

Variables		No. item	MEAN	SD
Strategic change	Organizational culture	5	19.53	3.14
	Organizational hierarchy	4	15.72	2.46
	Human resource	7	26.83	4.69
	Total	16	62.09	9.31
Total quality management	Leadership supportive	5	18.92	4.27
	Customer focus	4	15.17	3.58
	Strategic planning	4	15.02	4.37
	Workforce focus	5	18.91	5.18
	Total	18	68.05	15.96
Organizational culture	Clan	5	19.37	3.84
	Hierarchy culture	4	14.79	2.98
	Adhocracy culture	5	19.49	2.89
	Market culture	4	15.52	2.42
	Total	18	69.18	10.13

The result in model 4 shows that there is a strong impact of OC on TQM that supports *H3*. On the other hand, the Table 6 shows that the culture ($\beta = 0.809$, $P < 0.001$, $R^2 = 0.654$). while the adhocracy culture ($\beta = 0$ .612, $P < 0.001$, $R^2 = 0$ .375), market culture ($\beta = 0.694$, $P < 0.001$, $R^2 = 0.480$) and hierarchy culture ($\beta = 0.461$, $P < 0.001$).

Mediating Effect: The main idea of the mediator between three variable impacts is to examine when Z leading the relationship between X and Y. in another word Z change the relationship between X and Y, it may increase or decrease (Sampedro-Matarín et al., 2006). Although to evaluate the mediating role of SCH strategic change between organizational culture (OC) and total quality management (TQM), the study follows Woodworth's model 1928 and (Baron & Kenny, 1986). The first step to test the direct relationship between the organizational culture-independent variable and SCH. the dependent variable to establish that there is an impact that may be mediated. The previous analysis in Table 5 Model1. Shows that the variables of OC significantly indirect impact on SCH see also (Fig. 1 and Table 7). Which the criteria for the first one was fit (MacKinnon, 2008). The second step is to ensure that the mediator variable affects the dependent variable. When we look back to Table 5. Which shows there is a positive impact on TQM. That is mean the criteria of the second step were met. The third step is to examine if the mediator factors affect the dependent variables. Table 5 and Fig. 1 show a positive and significant impact on TQM. Therefore, criteria three were met. In the fourth step, the study conducted a regression analysis to evaluate the mediating role of SCH strategic change in the relationship between OC variables and TQM practices. which the result of Table 6 Model 3 & 4, Figs. 1 and 2, and Table 7, indicates that the strategic change (SCH) lead to a decrease in the effect size such as (the strength of clan variable of organizational

Table 6 summary of the result of the multiple linear regression models

		Unstandardized coefficients		Standardized coefficients	T		Sig
	Model	B	Std. error	Beta		R^2	
MODEL1							
Dependent Variable: SCH	Clan	1.790	0.075	0.823	26.716	0.678	0.000
	Hierarchy culture	1.995	0.139	0.573	12.861	0.328	0.000
	Adhocracy culture	2.734	0.092	0.849	29.584	82.1	0.000
	Market culture	2.872	0.139	0.748	20.736	0.559	0.000
MODEL2							
Dependent Variable: TQM	Organizational culture	3.467	0.201	0.663	17.206	0.465	0.000
	Organizational hierarchy	3.408	0.300	0.525	11.364	0.276	0.000
	Human resource	2.796	0.105	0.822	26.579	0.676	0.000
Model3							
Dependent Variable: TQM	Clan	3.644	0.108	0.877	33.655	0.770	0.000
	Hierarchy culture	2.472	0.258	0.461	9.566	0.213	0.000
	Adhocracy culture	3.380	0.237	0.612	14.249	0.375	0.010
	Market culture	4.568	0.258	0.694	17.737	0.480	0.000
Model4							
Dependent Variable: TQM WITH SCH Mediator	Clan	2.994	0.186	0.721	16.078	0.781	0.000
	Hierarchy culture	1.235	0.221	0.018	0.446	0.614	0.000
	Adhocracy culture	-1.053	0.348	-0.191	-3.022	0.624	0.003
	Market culture	1.611	0.324	0.245	4.797	0.640	0.000

culture change with mediator SCH from ($\beta = 0.877$ to $\beta = 0.772$), market culture change from ($\beta = 0.694$ to $\beta = 0.245$). while the significant remains the same. The result of the study agrees with other studies such as (Haffar et al., 2013). Thus the study SCH strategic change can be explained as a partial mediator in the relationship between organizational culture variables and TQM practices. Therefore, the result indicates that OC indirectly affects TQM practices via the impact on strategic change SCH. That result support *H4* (Figs. 3, 4, 5 and Tables 8 and 9).

Table 7 (Multiple linear regression analysis) (H1–H4)

Models	Hypotheses	R	R square	Adjusted R square	Std. an error of the estimate	Change statistics				
						R square change	F change	df1	df2	Sig. F change
1	*H1*	0.902[a]	0.813	0.813	4.03098	0.813	1476.157	1	339	0.000
2	*H2*	0.784[a]	0.614	0.613	9.93561	0.614	539.266	0.784[a]	0.614	0.000
3	*H3*	0.809[a]	0.654	0.653	9.40236	0.654	641.713	1	339	0.000
4	*H4* (mediating testing)	0.819[a]	0.670	0.668	9.20019	0.670	343.144	2	338	0.000

Table 8 Multiple linear regression analysis

Dependent	Variables	B	SD Error	Beta	t	P-value
Total Quality Management (TQM)	Constant	−31.859	3.855		−8.265	0.000
	OC	0.862	0.109	0.547	7.932	0.000
	Gender	6.666	1.037	0.206	6.430	0.000
	SCH	0.438	0.119	0.255	3.667	0.000
	Work experience	1.464	0.531	0.087	2.759	0.006
	$R = 0.841$ $R^2 = 0.707$ Std. Error = 8.70			$F = 202.270$ P-value = 0.000 df. = 4		

9 Results and Discussion

The aim of the study was to clarify of the mediating role of strategic change on the relationship between total quality management, organizational culture the result of the study has shown that the level of strategic change has a direct impact on the process of TQM practice. These findings support by other studies such as Haffar et al. (2013). Additionally, the strategic change can be explained as a partial mediator in the relationship between organizational culture variables and TQM practices. As well as the study emphasized the role of organizational culture to effectively transition across the various layers of organizational structure. On the other hand, the finding of this study indicates that organizational culture is highly affected by the strategic change. As a result, the organization believes how important a culture of belief and change is to be created. The organization often involves its members to make a change, and the organizational structure is distinguished by a high degree of cooperation between the various units to achieve strategic change. Therefore, the findings of the study indicate that the organizational culture (OC) is an impact on strategic change. In addition, some scholars, such as jones (2005) have found that clan/adhocracy and culture forms are correlated with higher levels of change. While (Iljins et al., 2015) have found that the organizational factors influencing organizational climate. In the current research, similar results were found where the degree of change is positively affected by the clan (that people get things in common. deep links of commitment, custom, and shared experience typically form) and styles of the culture of adhocracy. Furthermore, it is obvious from the findings of this analysis that a high degree of change is correlated with consumer culture. Therefore, the findings of this study suggest that organizations governed by forms of clan/adhocracy and consumer culture promote enhanced applicability of change. Hence, if they consider their work environment to have the factors associated with either a clan or adhocracy culture forms, members of an organization are more likely to have higher levels of change. In addition to that, the leadership of such organizations also used to appreciate employee engagement and empower their workers by setting up a fair system of benefits and rewarding the members who share in the progress of the implementation process. This contributes to improving the emotions and confidence of the participants in honesty and personal benefits that will be achieved because of involvement in the introduction

Table 9 Estimate—regression weight

			Estimate	S. E	C.R	P-VALUE	Standardized regression weights	Direct effect	Decision
SCH	<--	OC	0.829	***	38.477	***	0.902	0.829	Supported *H1*
H1									
TQM	<--	SCH	0.497	0.124	4.020	***	0.290	0.497	Supported *H2*
H2									
TQM	<--	OC	0.863	0.114	7.596	***	0.548	0.863	Supported *H3*
H3									

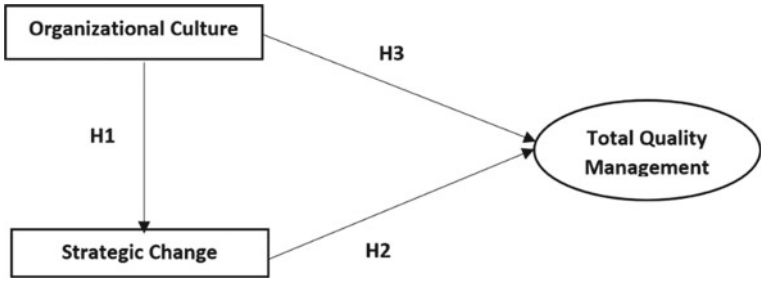

Fig. 1 Explained the study conceptual framework

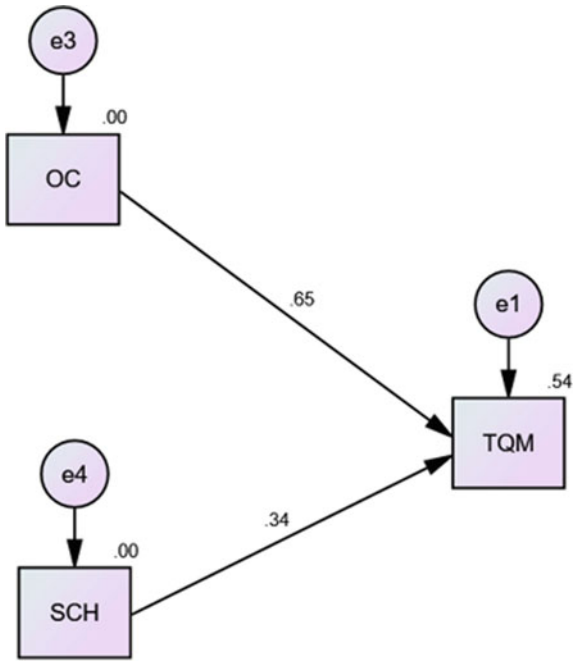

Fig. 2 Three variables relationship without mediator and without the correlation between OC–SCH

of new intrusive change initiatives. This confirms the results of several scholars, such as (Latta, 2009). who found that if members of organizational fairness in processes of change, they would have more personally prepared to adopt readiness of change? Moreover, the findings of this research show that the most positive culture groups for TQM are compared to cultural forms, community, and consumer culture. While the Cultural forms of hierarchy and adhocracy are the least encouraging to TQM. This is consistent with the results of various research studies, such as (Gimenez-Espin et al., 2013).

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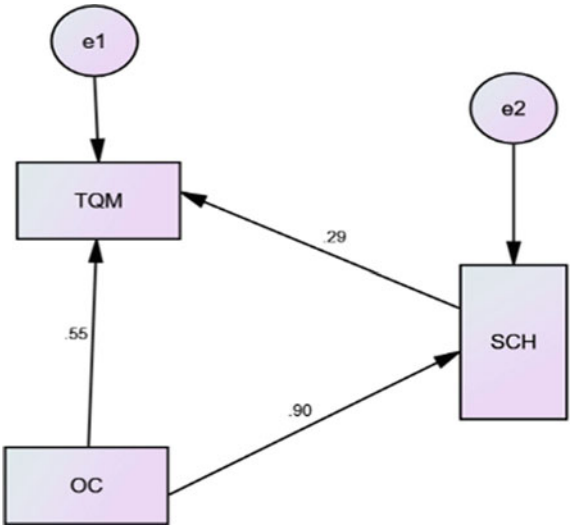

Fig. 3 Variables relationship with a mediator

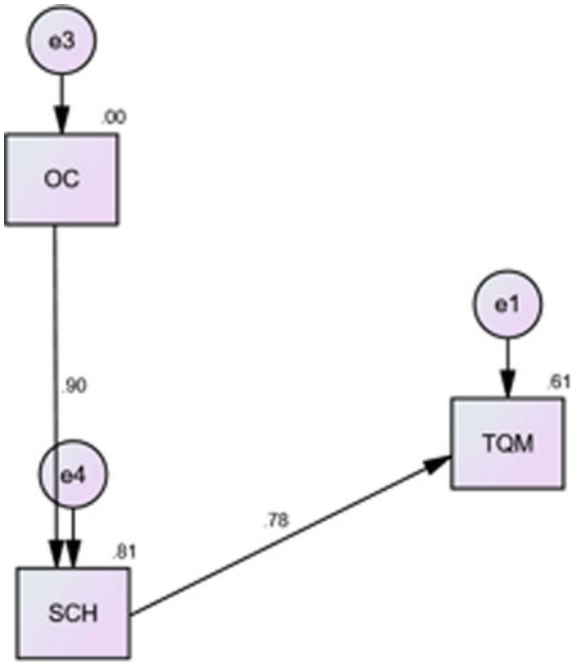

Fig. 4 Variables relationship with a mediator and without the correlation between OC and TQM

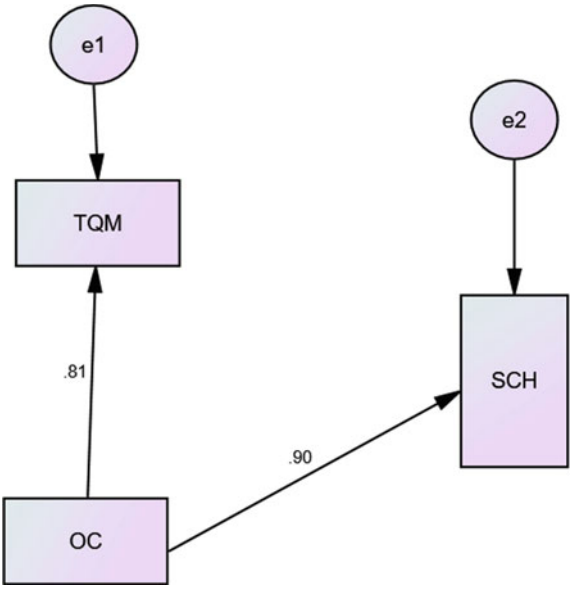

Fig. 5 Variables correlation without the correlation between TQM–SCH

According to the effective implementation of the TQM includes long-term strategic planning. Authors stress strongly on the value of strategic planning (Hitchcock & Willard, 2002; Sinclair & Zairi, 2001). Involvement and dedication of managers at various levels is important for the implementation of Juran and Godfrey (1999), Crosby (1989). Between OC and supportive leadership in TQM is consistent with the results of previous studies such as (Mustafa & Bon, 2012; Waldman, 1993; Zhang et al., 1999). Furthermore, the findings of this research demonstrate the lack of relevance for total quality management (TQM) of the hierarchical society. In addition, the finding of this study shows that the culture of adhocracy has less of a noticeable effect on TQM. Help for this performance with the study of Yong and Pheng (2008).

10 Conclusion

The result of the study revealed that strategic change has a direct impact on the TQM practices. In addition to that, the strategic change can be explained as a partial mediator in the relationship between organizational culture variables and TQM practices. The result of the study also found that there is a positive and significant effect of organizational culture on strategic change. On the other hand, the results analysis for TQM and strategic change revealed that the strategic change positively effects on total quality management in various areas.

However, we agree that this study laid the groundwork for future research to explore and extend the connection between Total quality management, organizational culture, and strategic change.

Finally, we conclude that to achieve success change TQM and organizational culture are important factors for any organization for gaining competitive advantages, increasing productivity, satisfying customer needs, and survive.

11 Limitations and Future Research

There may some limitation in this study that led to avenues in future research. First, the current research has evaluated the mediating role of strategic change (SCH) that possible the organizational culture impact on total quality management (TQM), however, future study, may recognize and explore the effect of other potential mediators in the connections between OC and TQM, as they will support extend our conceptual explaining the mechanism whereby the organizational culture influences the implementation of TQM.

Second, the study suggests that future work may include samples from a greater geographic area in UAE or be expanded to a multi-country analysis. Thus, the current study findings contribute to the global picture form the basis for future, more integrated studies.

According to the results, the study recommended that future research might investigate if other possible mediating variables may also mediate whatever totally or partially the effect of the relationship between TQM and organizational culture. Second thing, future studies can expand the respondents more than this study. Additionally, future studies may use the (SEM) Structure Equation Modeling that enhances the result by building a more convenient model of the study. Moreover, the researcher may use the result of this study to examine more specifically the relationship between two variables such as organizational culture with strategic change, TQM and organizational culture, or organizational culture and strategic change.

Finally, in current research, as in most recent research, regression analysis tests for hypotheses have been used. Although structural equation modelling (SEM) can be a useful technique for the analysis of large data, such as Kline (2015; Mueller & Hancock, 2008). considering that SEM is a large sample technique that needs to be used but the study couldn't implement because of the number of participants in the research is less than 400. For future research, it is suggested to use SEM with greater sample size and a higher number of participants' expectations.

12 Implication and Recommendations

The current study conducted within the COVID-19 pandemic. As most organizations are making a change in different fields of their organization to face the crisis and

survive (Ahmad et al., 2021; Alameeri et al., 2021; Alshurideh et al., 2021b, 2021c). It is hoped that the findings of the analysis will be useful to managers, even after the present crisis has ended. Having taken the study techniques and organizational culture variables into consideration to apply total quality management.

In addition to that, creating a positive environment will also promote the willingness of employees for the change process and encourage their participation in the implementation of TQM. In turn, this increases the chance of a successful TQM implementation in organizations, especially in the current situation with the COVID 19 pandemic, which gives the managers new experience to come up with innovative ideas to keep up and maintain the TQM success.

What Emirate Post Group have to do to improve their business?

- Foster high performing organization culture by defining the organization ethically, enabling two-way communication, rewarding employee, and empowering the team.
- Redesign the performance evaluation process to ensure that the individual goals align with the department goals.
- Develop learning manuals for new joiners.
- Document job descriptions.
- Update the HR process.
- Establish a cultural periodical review and continuous improvement.

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Educational Supply Chain Management: A View on Professional Development Success in Malaysia

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Abstract The industrial environment is unpredictably shifting. Technology advancements and pandemics force the corporate environment to evolve even faster in order to stay competitive and thrive. As a result, in today's fast-paced business environment, supply chain management has grown in popularity. The study's major goal is to apply the concept of industrial supply chain management to educational management. The empirical study will be conducted separately and do not cover in this paper. In dynamic and uncertain business operations, the educational model is more appropriate to switch from mass production delivery to industrial experiences in building individual talent excellence. This minimizes the educator's knowledge and experiences delivery gap to the learner in the educational supply chain. From the issues, This study identifies the education attributes and how it affects professional development success. This study further investigates the moderating effect of industrial experiences on the relationship between education attributes and professional development success. Besides, this study aims to propose an educational supply chain model (EduSCM) for 21st-century professional development success in

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_136

Malaysia higher education to gain competitive advantages. To achieve the objectives, mixed methods research design is proposed. The qualitative data collection will be collected after the completion of quantitative data analysis. The data collected from the interview use to explain, interpret, understand, and triangulate the results of quantitative analysis to produce a potent conclusion. Lastly, this study will provide a unique conceptual diagram expected to aid researchers and practitioners to create a more comprehensive understanding of the linkages between learning competencies, industrial experiences, and professional development.

Keywords Educational supply chain management · Professional development success · Industry experience · Malaysia

1 Introduction

The initial concept of logistics began in 1950 and the concept matured in 1970 (Habib & Jungthirapanich, 2008a, 2008b). The industry noticed that the logistics concept plays an essential role in the business environment and gets critical, and the logistics elements also get more comprehensive. Therefore, in 1980, the focus of the logistics concept is switched, and the supply chain management concept is initiated. Due to the power of the supply chain concept, researchers and academicians start researching the concept, and the publication was available in 1982. In 1985, the manufacturing industry realized the usefulness of the supply chain management concept in managing their operation. The manufacturer applies the supply chain management concepts as strategic and systematic coordination of business activities to reduce costs, improve customer service, enhance quality, and increase competitiveness (Tan et al., 2002). In 1990, more and more researchers started exploring the concept and the area that can be researched in the supply chain (Huan et al., 2004; Cooper, 2006).

The power of supply chain management concept and the result of research activities from academician influenced the service industry as one of the main sections in a country start to implement supply chain management concept in-service operation in 1995. After five years, in 2000, it gains incredible attention from academics and practitioners (Chan & Qi, 2003). The concept of educational supply chain management started to emerge in 2007 as it is one of the service industries and aims to produce the right talent that can meet the industry needs (Habib & Jungthirapanich, 2008a, 2008b). In 2010, the market no longer competed between the organizations but between the supply chain to gain competitiveness (Gunasekaran et al., 2008). Technology advancement is moving faster than ever in the current decades. Therefore, the digital supply chain starts to emerge in 2017, focusing on integrating the information system to increase the efficiency, reliability, and transparency of the overall supply chain (Büyüközkan & Göçer, 2018; Korpela et al., 2021). In short, the supply chain management concept becomes more and more important in the current

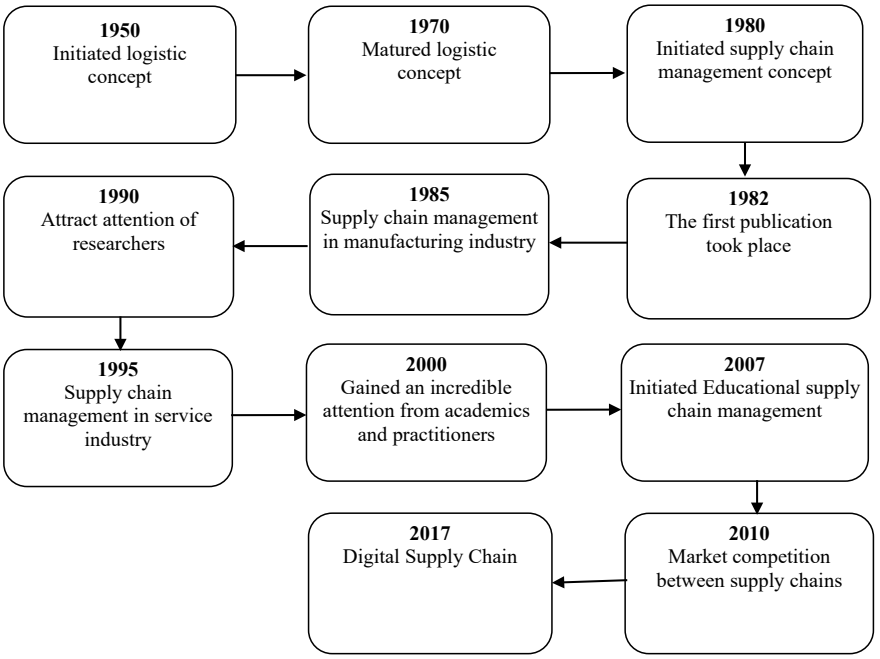

Fig. 1 The Evolution of Supply Chain Management. Source. Adapted from Lee et al. (2018)

industries, not only in the manufacturing but also in the service sectors, including the education sector. The evolution of supply chain management is illustrated in Fig. 1.

The graduates' statistics 2019 reported by DOSM (DOSM, 2018) shows that the number of graduates in Malaysia was increased from 4.94 million to 5.29 million in 2019. Based on the statistics, the number of graduates was increased. However, the employment rate was slightly decreased from 83.6 to 83.5%. The statistical number shows the employment rate and whether the graduates produce and are employed in the right field based on the program graduate is another issue. The mismatch in the supply and demand of graduates between higher institutions and industry needs remains a critical discussion topic until today. Employers claimed graduates lacked the necessary knowledge, skills, and attitudes. Computing skills, teamwork, English language proficiency (Markussen-Brown et al., 2017), previous training, and the graduate's personality are the five most important employability qualities, according to a recent research (Belwal et al., 2017). According to McKinsey report in education to employment, only 40% of graduates are completely prepared by the university to work in the real industry ield (Coffield, 2012). Obviously, Malaysian education needs to have a new professional development success model in handling contemporary issues.

Therefore, this paper investigates the relationship between education attributes and professional development success in Malaysia and how the moderating effect of industrial experiences in the relationship. Ultimately, this paper aims to propose an

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educational supply chain model (EduSCM) to improve the professional development success in Malaysia.

2 Literature Review

Resource-Based View (RBV) theory becomes an essential guide for this paper. The concept of RBV in this paper demonstrates the process of transformation of learners to be the professional development success which can be the employee or entrepreneur in the job market or industry (Barney, 2001; Grant, 1991; Halldorsson et al., 2007; Peteraf, 1993; Wernerfelt, 1984, 1995). The entrepreneur can be the job creator that offers the job opportunity to the job seeker. This paper believed that the parent participation and the learning environment are the primary resources for the learning process and the success of the professional development need to go through school education, tertiary or higher education, lifelong learning, and the most important is the industrial experience to gain a sustainable competitive advantage (Barney, 2001; Grant, 1991; Peteraf, 1993; Wernerfelt, 1984). The six measurements will measure the education attributes in which leadership skills, ethics and spirituality, national identity, thinking skills, language proficiency, and knowledge. The four measurements will be used to measure the professional development success in which holistic, entrepreneurial and balanced graduates, talent excellence, lifelong learner, and quality technical and vocational graduates. The application of RBV theory in educational supply chain management is shown in Fig. 2.

There are 672 higher learning institutions in Malaysia, consisting of 70 private universities, 20 public universities, 34 private university colleges, 410 private colleges, 33 polytechnics, 91 community colleges, and 14 higher institutions centres of excellence (HICoE), as shown in Table 1. In addition, there are 67,747 academic staff and 1,157,000 students in higher learning education in Malaysia, as shown in Table 2. The Ministry of Higher Education (2014) research noted that only 75% of

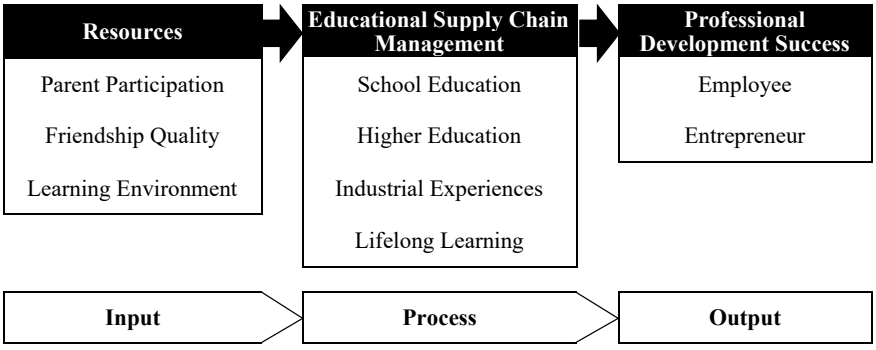

Fig. 2 Resource-based view theory in educational supply chain management. *Note* Adapted from Lee et al. (2018)

graduates are employed. Moreover, McKinsey (2012) noticed that only 40% of graduates are entirely prepared to work in the real industry. The International Standard Classification of Education (ISCED) level five encompasses Diploma, Advanced Diploma, Postgraduate Diploma, Professional Certificate, Bachelors, Master's, and Ph.D. programmes.

The phenomenal expansion of Malaysia's higher education industry over the previous two decades has aided in the country's internationalisation. The primary goals, according to the Ministry of Higher Education (MOHE), are to guarantee that all Malaysians have better access to excellent higher education by maximising the resources of current public and private higher education institutions. Malaysia's well-structured higher education system is critical to accomplishing professional development goals. Ethics and spirituality (Frich et al., 2015; Puchalski et al., 2014) leadership skills, national identity, language competence (Murray, 2011; Noom-Ura, 2013), thinking skills (Petersen, 2007) and knowledge are six main qualities for individual pupils presented in a recent study. Industrial experience is recommended to play a moderating role in enabling higher education to work closely with industry to guarantee that supply and demand are met demand. As a result, modern educational trends place a greater emphasis on delivery, accountability, openness, and outcomes rather than input.

Table 1 Higher learning institution in Malaysia

Higher learning institution in Malaysia	Number of institution
Public Universities	20
Private Universities	70
Private University Colleges	34
Private Colleges	410
Community Colleges	91
Polytechnics	33
Higher Institutions Centres of Excellence (HICoE)	14
Total	672

Source Adopted from Malaysia Education Blueprint 2015–2025

Table 2 Students and academic staff in higher learning institution in Malaysia

Higher learning institution in Malaysia	Number of academic staff	Number of students
Public Universities	33,199	560,000
Private Universities, Private University Colleges, and Private Colleges	24,476	485,000
Community Colleges	2,816	22,000
Polytechnics	7,256	90,000
Total	67,747	1,157,000

Source Adopted from Malaysia Education Blueprint 2015–2025

It's recommended that a graduate be considered outstanding academic performance is comprised of holistic, entrepreneurial, talent excellence, lifelong learner, and quality technical and vocational. Education entrepreneurs must improve professional development success (Ruskovaara et al., 2015) through curricula that earned the country international recognition. Lifelong learning can be achieved through the current trend of globalized online learning (Fine & Zygouris-Coe, 2011). This is supported by the fact that Malaysia presently has a 67% internet penetration rate, which is the seventh-highest penetration rate in Asia, indicating significant potential. Besides, In dynamic and uncertain business operations, the educational model is more appropriate to switch from mass production delivery to personalized learning experiences in building individual talent excellence (Alshurideh, 2012; Fraser-Seeto et al., 2014; Nijs et al., 2014). The conceptual framework of educational supply chain management is illustrated in Fig. 3.

By focusing on supply chain reliability, responsiveness, agility, and costs, today's supply chains are more likely to respond quickly, efficiently, and effectively to changes, volatility, and turbulence in the marketplace to achieve, succeed, and sustain competitive advantage in the new edge of business environment that is more global, customer-driven, and technologically oriented. In Malaysia, several supply chain management studies have been done. Supply chain management, according to the trends, has offered several benefits to the supply chain or company. Firms have used the supply chain to globalise their business, particularly in recent years, in order to

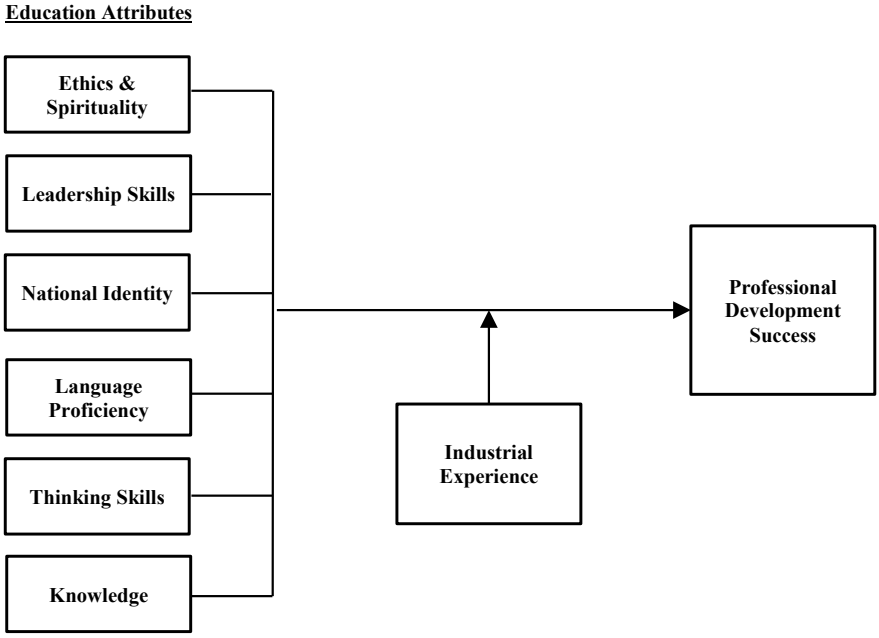

Fig. 3 Conceptual framework of professional development success

satisfy customers with high-quality products and cost-effective delivery (Al Dmour et al., 2014; Crinis, 2012; Lam & Postle, 2006). However, there are just a few studies that have used supply chain management theory to manage educational operations.

Educational supply chain management is based on the same principles as existing industrial supply chain management methods Kurdi et al. (2021). The supply chain also has upstream and downstream components. The upstream educational supply chain refers to the movement of students, information, and finances from early childhood education (kindergarten and pre-school) to primary, secondary, higher education, and higher education. However, parental involvement and the quality of children's friendships are crucial, and they can have a considerable influence on the quality of graduates produced. This stage may be viewed as laying the groundwork for producing high-quality graduates in the future. This is due to the fact that both elements are considered raw material providers. With low-quality raw materials and inefficient manufacturing methods, it is difficult to generate a high-quality product. The downstream educational supply chain, on the other hand, refers to the delivery of graduates to industry as employees or the business world as entrepreneurs. According to the newest Malaysia Education Blueprint 2015–2025, graduates are not need to be job seekers in order to be employed; instead, they may be job creators in order to be entrepreneurs who give work possibilities to job seekers.

Parents' involvement and the quality of their friendships are seen as requirements for generating high-quality graduates (Alshurideh, Salloum, Al Kurdi, & Al-Emran, 2019; Pittman & Richmond, 2008; Salloum et al., 2020). Since their children are born, parents may have a big influence on them. Before sending their children to school, they spend a long time together. Even at school, the school day is shorter than the time spent with parents. According to statistics, parent involvement in the educational supply chain is important (Alshurideh, 2022; Alzoubi et al., 2022; Joghee et al., 2021; Shamout et al., 2022). Furthermore, one of the most important factors in creating high-quality graduates is friendship quality (AlHamad et al., 2022; Amarneh et al., 2021; Lee et al., 2022a, 2022b). Although friendship quality did not have a direct impact on academic achievement, it was found to be strongly connected to the reduction of problem behaviour in individuals (Bettayeb et al., 2020; Lee et al., 2022a, 2022b). Problem behaviour is thought to be the cause of poor academic achievement (Al Kurdi et al., 2021; Alshurideh et al., 2022). To make the registration process go well, however, coordination between parents, friends, and the school is necessary.

Collaboration between higher education and schools is essential. The partnership can guarantee that the appropriate resources are developed and available for higher education. This not only enhances the student's competence and ability for further schooling, but it also raises the student's potential for future grooming. A high-quality input is thought to provide a high-quality output in supply chain management (Al Ali, 2021; Alshurideh et al., 2020a, 2020b; Kashif et al., 2021). Some of the issues that arise in higher education stem from students' academic performance. One of the most important factors in a student's ability to succeed in higher education is the school's academic success (Akour et al., 2021; Alzoubi, 2021a, 2021b; Lee & Ahmed, 2021). A shaky foundation creates a gap in the learning process for the pupil. This had an impact on pupils who had a weak foundation, as well as the entire

teaching and learning process. It might have an impact on how a lecturer teaches and how other students in the same class learn.

Furthermore, collaboration between higher education and industry cannot be ended at any point throughout the educational process. For the transition from student to employee or entrepreneur, both sides must communicate effectively (Cruz, 2021; Kurdi, Alshurideh, & Salloum, 2020a, 2020b, 2020c; Radwan & Farouk, 2021). This is because the industry's demands can only be met if the industry's higher education requirements are shared, as the industry's primary source of graduates (Alshurideh, Al Kurdi, et al., 2019a, 2019b, 2019c; Alzoubi, 2021b; Aziz & Aftab, 2021). All of the grads are not necessarily searching for full-time employment. Graduates, on the other hand, can become entrepreneurs who generate jobs and give them to others. This seeks to lower the unemployment rate among graduates, as stated in the Malaysia Education Blueprint 2015–2025 (Ali et al., 2022).

According to the explanation above, data, information, and knowledge exchange are essential throughout the educational supply chain process (Alzoubi and Yanamandra 2020; Mehmood et al., 2019; Mehrez et al., 2021). As illustrated in Fig. 2, the sharing must be evenly balanced between curriculum design and industry demands (Al-Maroof et al., 2021a, 2021b; Alshurideh et al., 2019a, 2019b, 2019c; Farouk, 2021; Obaid, 2021). This is to guarantee that the information shared from industry to higher education is successful in developing curriculum that produces high-quality graduates who meet real-world industry requirements (Akhtar et al., 2021; Eli, 2021). This method maintains higher education curriculum design current while also lowering the jobless rate. Industry is continuously on the lookout for people who have the necessary knowledge and abilities for the job (Al Kurdi et al., 2021; Alshurideh et al., 2020a, 2020b; Alzoubi et al., 2020a, 2020b; Kurdi et al., 2020a, 2020b, 2020c). This indicates that the recruited person is capable of doing the job without any basic training, therefore meeting the ultimate expectation from industry to higher education. Prior to that, all programmes need an industrial internship for students to learn about real-world industrial functions. Consistent measurement is used and discussed to achieve consistent performance at all levels, including school, higher education, and industry (Alshurideh, 2014; Alshurideh et al., 2015, 2021a, 2021b; Al-Maroof et al., 2021a, 2021b; Alnazer et al., 2017; Ghazal et al., 2021; Kurdi et al., 2020a, 2020b; Nazir et al., 2021).

In educational supply chain management, student performance should be evaluated in all elements of the learning process, including ethics and morals, as well as knowledge and abilities. (1) ethics and spirituality, (2) leadership skills, and (3) national identity make up ethics and morals, whereas (1) language proficiency, (2) thinking skills, and (3) knowledge make up knowledge and skills. However, as shown in Table 3, the measures may be divided into two stages: school level, higher education, and industrial level (Alshamsi et al., 2020; Alsharari, 2021; Alsharari & Alshurideh, 2021; Alshurideh et al., 2021a, 2021b; Leo et al., 2021; Mehmood, 2021; Sultan et al., 2021).

In responding to these needs, this study summarised the concept of educational supply chain management as shown in Fig. 4. is expected to be fundamental to provide a comprehensive, integrated view on all aspects and facets of learning competencies,

Table 3 Definition of measurements used in conceptual framework

Measurements	Definition	
	School level	Higher education and industry level
Ethics and spirituality	Possesses solid moral foundation and courage to make right decisions	Ethically and morally upright, spiritually grounded, compassionate and caring; appreciates sustainable development and a healthy lifestyle
Leadership skills	Has strong communication skills, is entrepreneurial, resilient, can lead and work in teams	An effective communicator, emotionally intelligent and able to work across cultures; is socially responsible, competitive, resilient, and confident
National identity	Proudly identifies as Malaysian and embraces diversity	Pride in Malaysia and an understanding of Malaysia in relation to the world
Language proficiency	Operationally proficient in at least "Bahasa Melayu" and English	Proficient in "Bahasa Melayu" and English, and encouraged to learn one additional global language
Thinking skills	Inquisitive and innovative can apply, create, and connect knowledge to provide solutions	Appreciates diverse views, can think critically and innovative, as a problem-solving initiative, and has an entrepreneurial mindset
Knowledge	Mastery of core subjects and general knowledge about the world	Has mastery of own disciplines, can harness, connect and apply knowledge learnt, and has an appreciation of culture, arts, and Science, Technology, Engineering and Mathematics (STEM)

Source Adapted from Puchalski et al. (2014)

personalized learning experience, and professional development success (Guergov & Radwan, 2021; Khan, 2021; Miller, 2021; Mondol, 2021).

3 Methodology

There are three primary research paradigms in social science research: quantitative, qualitative, and mixed-method research design (Hanaysha et al., 2021a, 2021b). Convergent parallel, explanatory sequential, exploratory sequential, embedding, transformational, and multiphase designs are the six types of mixed-method study designs (Alhamad et al., 2021). This study concentrates on professional development success through educational supply chain management in Malaysia higher education. Therefore, the population in this study is Malaysian higher education graduates

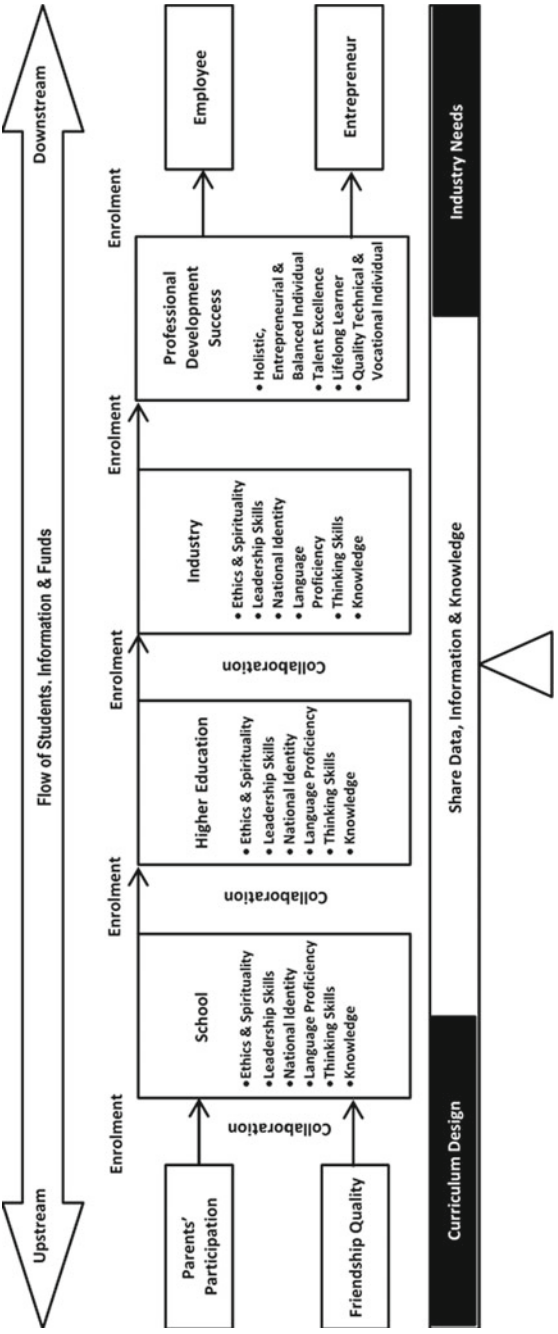

Fig. 4 Conceptual diagram of educational supply chain management

(Puchalski et al., 2014) to provide information for this research. Thus, the unit of measure of this study would be individual. The population of this study will be 504,000 individuals, and the sample size will be 384 individuals (Alzoubi & Aziz, 2021). A convenient sampling technique will be applied to determine the sample.

In a mixed method research design, survey questionnaires will be the instrument used to collect quantitative data, while the case study will be used to collect qualitative data. The respondents will be asked to answer the simple and convenient 5-point Likert scale questions (Hamadneh et al., 2021; Hanaysha et al., 2021a, 2021b). The survey questionnaire will distribute to 384 individuals, and three samples will be chosen from quantitative respondents for the case study. After the data collection, the collected data will be analyzed using the structural equation modeling (SEM) technique using SmartPLS 3.0 software. After completing quantitative data analysis, the next step is to prepare an interview protocol or semi-structured questionnaire for the case study, a face-to-face interview to collect qualitative data (Alzoubi et al., 2021). According to Ali et al. (2021) and Alzoubi et al. (2020a, 2020b), there is no rule of thumb to identify the sample in the qualitative study. The study is proposed to have three samples for the qualitative phase, and the sample will be selected from the quantitative respondents based on the result of quantitative data analysis. After the interview with the individuals, the software ATLAS.ti will analyze the data collected from the interview session. The combination of quantitative and qualitative data will produce a potent conclusion for this study (Alnuaimi et al., 2021; Alzoubi & Ahmed, 2019; Joghee et al., 2020).

3.1 Expected Implications

An appropriate combination of existing education attributes, industrial experience, and professional development success can help firms gain a more comprehensive picture of operational effect across their value chain. Institutions along the education supply chain would make more use of clear and consistent education attributes. In addition, by highlighting the effects of Malaysian educational attributes and industrial experience on the country's professional development success consequences of higher education institutions. Academicians of these institutions can benefit from the six education attributes that can be developed in addressing the issue. The model is expected to help the academicians to recognize and control the effects of education attributes.

It is strongly believed that the six education attributes and industrial experience initiated from the model developed will mitigate school, university, or company's social impact. This impact will shape not only the quality of graduates but also make professional development success and business operation more effective and efficient. In the long term, these will impact the economy of Malaysia, which is robust in advance professional development and ultimately contribute to the Gross Domestic

Product (GDP) of Malaysia. Finally, contribute to Malaysia's reputation and international standards by professional development through an educational supply chain model well-known globally.

Acknowledgements The authors are grateful to the Ministry of Higher Education (KPT), who has provided generous financial support through the MyGrant, Fundamental Research Grant Scheme, FRGS/1/2018/SS03/UMP/02/3.

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Linear Discrimination Analysis Using Image Processing Optimization

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Abstract When we talk about Machinery Vision and Deep Learning, we often talk about algorithms. In fact, mathematical models with computer knowledge are the basis of how we deal with graphical data to process the Image and make decision. Machine learning can play an important role in determining agricultural plant type in order to optimize the harvesting steps in an automated way. How to process and introduce the products to the market often requires detailed information about the stages of planting and harvesting. In addition, by using this method, sophisticated research can be designed in plant genetics and effect of environmental variables on the end product. The ultimate goal of this work is to use Linear Discrimination Analysis for the Image Processing and classification of harvested wheat grain which are belonged to different types of grain namely Rosa, Kama and Canadian. The above discovery has proved with the statistics to have with more than 94% of accuracy.

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_137

Keywords Data science · Agricultural products · Clustering · Harvesting expert system

1 Introduction

Wheat grain with the highest nutritional value is the main resource of starch, fibers, amino acids, phenolics and polycarbonates. The wheat grains can be used as the supplemental ingredient of foods with low amino acids, phytases and antioxidants. Lactic fermentation also significantly improved protein digestibility and a satisfactory reduction in glycemic index compared to bread made from wheat flour alone (Akhtar et al., 2021; Al Ali, 2021; AlHamad et al., 2022). Lactic acid bacteria have a great effect on improving the nutritional and functional properties of the product and the enzymatic activity of these bacteria is responsible for increasing phenolic compounds and soluble fibers in the final product and reducing the risk of cardiovascular disease, type 2 diabetes, some types Cancers and obesity (Alhamad et al., 2021; Ali et al., 2021, 2022; Alnazer et al., 2017).

The wheat grains are damaged in their harvesting or post harvesting stages due to mechanical and thermal shocks (Alnuaimi et al., 2021; Alsharari, 2021; Alshurideh et al., 2022). Wheat Kernel damage as the main driver for the detrimental effects affect their biological and physical properties. One of the most important factors causing damages in the wheat kernel is its moisture absorption, which can be measured from prepared seed sample with weighting after maintaining in several hours in distilled water at certain temperature (Alshurideh et al., 2020; Alzoubi, 2021a, 2021b). For the kernels with higher potency i.e., high tendency for damage, a significant difference can be measured by the electrical conductivity of the solution obtained from seeds with different potency. The electrical conductivity of seeds with higher potency can be significantly lower than that of seeds with lower potency. The laboratorial methods required for the measurement of physical properties need a controlled environment induce higher cost. Other methods such as Magnetic Resonance Imaging, laser or scanning electron microscopy is also very cost intensive (Alzoubi & Aziz, 2021; Alzoubi & Yanamandra, 2020; Alzoubi et al., 2020a, 2022).

As an optimal alternative, Soft X-ray Image processing measuring the geometrical and statistical parameters of kernels are well posed as the way of quality inspection and assessment most cereal internal structure where the naked eye cannot separate the wheat grain type. The main reason is that X-ray can be differently exposed in the damaged and undamaged regions of internal kernel (Alzoubi et al., 2021; Alzoubi et al., 2020b; Alzoubi & Ahmed, 2019; Aziz & Aftab, 2021). The main steps for the determination of the damage index of wheat kernels are.

Companies are now rapidly developing agricultural performance-enhancing algorithms that can show farmers what the best crop method is (Alhashmi et al., 2020; Cruz, 2021; Eli, 2021; Farouk, 2021; Ghazal et al., 2021a, 2021b). Despite some concerns about the difficulty of doing this kind of analysis in nature, farmers and

others can make great strides in maximizing yields simply by using intelligent algorithms and generators designed to help mimic computers. In simpler terms, the work of artificial intelligence has supported the idea that machines can provide deep insight into farmers and take many human arguments out (Al AlShamsi et al., 2021; Guergov & Radwan, 2021; Hamadneh et al., 2021; Hanaysha et al., 2021a; Shebli et al., 2021; Yousuf et al., 2021). Finally, it should be noted that population growth and climate change will be major challenges for the future of world agriculture, but the establishment and use of artificial intelligence can mitigate the impact of these challenges and other challenges and make smart agriculture in the face of problems. What farmers are facing is more resilient (Hanaysha et al., 2021b; Joghee et al., 2020; Kashif et al., 2021; Khan, 2021; Nuseir et al., 2021).

Linear Discrimination Analysis (LDA) is the method used in Machine learning for the recognition of two or more objects. In LDA, which is very similar to variance and regression analysis dependent variable is linearly relate to the other variables (Lee & Ahmed, 2021; Lee et al., 2022a, 2022a, 2022b; Mehmood, 2021). The difference between these methods is that in LDA, instead of distance relationship, dependent variable is solved by the ranking or ordinal outranking (Siddiqui et al., 2021; Zitar, 2021; Zitar et al., 2021). The LDA is also closely related to Principal Component Analysis (PCA) core component analysis. Because both methods look for a linear combination of variables that best describe the data. The LDA also attempts to model differences between different data classes. The LDA is used when the observation sizes are continuous values (Mehmood et al., 2019; Miller, 2021; Mondol, 2021).

In this paper, the essential data preprocessing stages are described in Chap. 2 then in Chap. 3 the configuration of the Weka Program for the LDA analysis are explained. Modelling methods is the subject of Chap. 4 and their tuning parameters are described in Chap. 5. The results are shown for the classification accuracy are discussed and the confusion matrix is represented. At last, the results are summarized and the usage of the Machine Deep Learning in wheat classification are discussed in the conclusion.

2 Dataset Description

A. Preprocessing stage

The dataset consisted of 210 instances corresponding to the three equal batches of grain for each class with 7 attributed. Wheat grain dataset can be extracted from the UCI repository dataset (Obaid, 2021; Radwan & Farouk, 2021; Shamout et al., 2022). The file was in the form of txt file and attributes a compaigned only with numerical values, then we used microsoft excel to name each column and export the result as a csv file. Since the ultimate goal of this work is to measure the misclassification of the randomly ordered classes with linear discrimination modelling, it is needed to use two filters for data preparation in this step (Al-Dmour, 2016; Al Hamadi et al., 2017; Al Neaimi et al., 2020). These are namely NumerictoNominal for object class

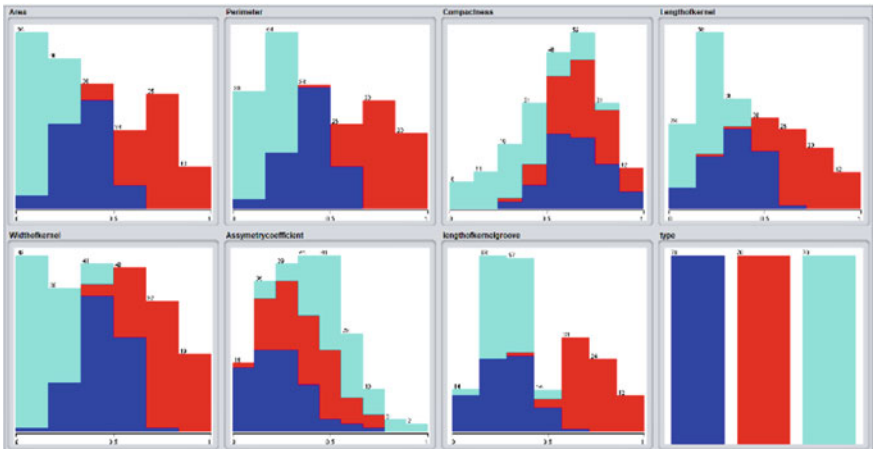

Fig. 1 Attribute distribution versus multi-nominal Class

and Normalize for all others. The normalization process transform all attributes to range [0,1] with mean 1 and variance 0. This can be used to control the bias error and reduce the risk of overfitting. As it is shown in Fig. 1, it is not possible to cover all the differentiae each of types with a single variable. That's evident from the fact that a coverage of the some of the area is existed where make the classification in that region impossible. For instance, Rosa Grain (red color) class can fairly be explained by the Area, Perimeter and length of kernel groove (Bibi et al., 2021; Ghazal, 2021; Maasmi et al., 2021).

Canadian and Kama Grain centroid are neat which is therefore difficult to separately classified by one single attribute (Al-Dmour & Teahan, 2005; Al-Hamadi et al., 2015, 2021). The advantage of the Linear Discrimination Analysis is where it is not possible to differentiate the class by a single attribute. LDA algorithm makes a linear relationship between the independent variable and classes to make this happen. The effect of each variable will be on the whole classification. The classification problem is to find a predictor for each class from the same distribution (not necessarily from the training set) given by the observation set x. LDA is assumed a conditional probability density function exist which are both have normal distributions with mean and covariance parameters.

B. Dimension Reduction

Linear Discrimination Analysis is a method similar to Principal Component Analysis and factor analysis; Both of these statistical methods are used to linearly combine variables in a way that best describes the data (Ali & Dmour, 2021; Al-Naymat et al., 2021; Aslam et al., 2021). A major application of both of these methods is to reduce the number of dimensions of the data. However, there are major differences between these methods: in Linear Discrimination Analysis, class differences are modeled, while in principal component analysis, class differences are ignored. The reduced

dataset was exported to reduced.arff in order to further analysis the reduced result by Linear Discrimination Analysis. In Fig. 2 the new variables are represented:

As it can be seen from the PCA analysis in Fig. 2, the first and second are posed well as a Principal Component Analysis. Figure 3 shows the graph of second versus first dimensions and the region inside the ovals are for each type of grain kernel.

(0.717Assymetrycoefficient-0.529Compactness
+0.377lengthofkernelgroove+0.206Lengthofkernel-0.117Widthofkernel...) versus
(0.444Area+
0.442Perimeter+0.433Widthofkernel+0.424Lengthofkernel+0.387lengthofkernelgroove...)

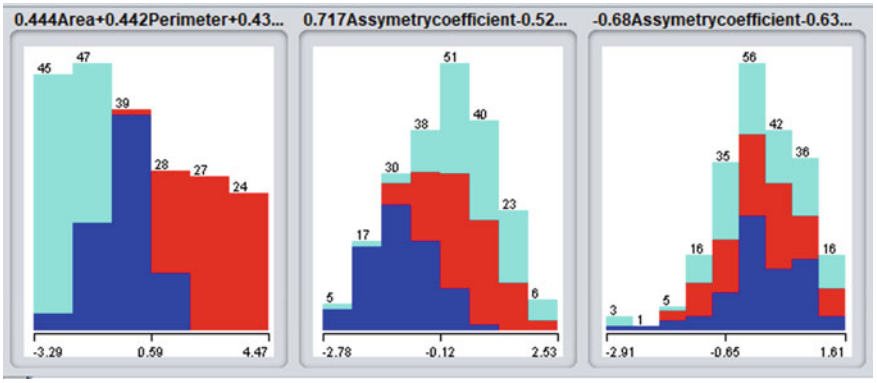

Fig. 2 Dimension reduction by PCA

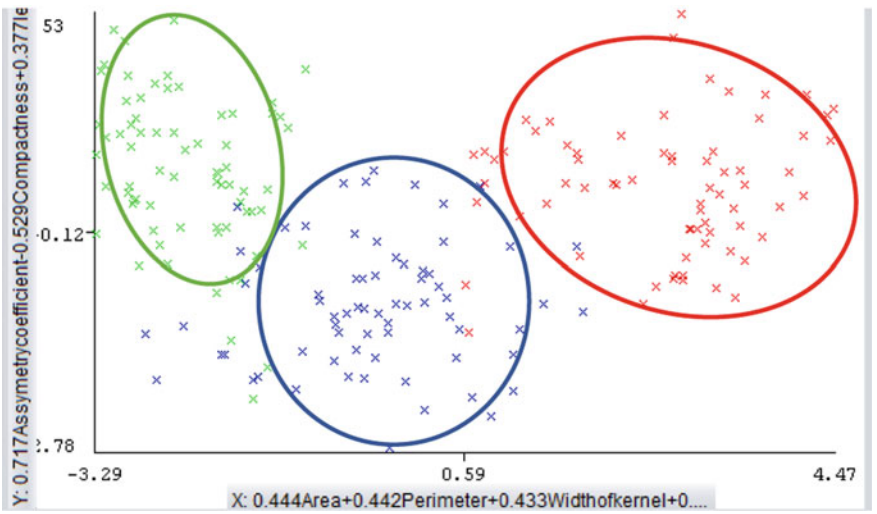

Fig. 3 PCA dimension

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3 Methodology

We have used python 3.6 to import the dataset into Jupyter Notebook. The details of results of coding within the description of every attributes are attached in the Appendix; For machine learning the Weka Program V 3.9 was applied.

```
import pandas as pd
data = pd.read_csv("wheat.csv")
data.info()
data.describe()
```

4 Modelling

After importing the dataset into the Weka program, modelling techniques utilized which was calibrated with the usage of hyper-parameter tuning where in k-nearest neighbors (kNN), the number of neighbors was chosen to be equal to 4 and in Neural Network (NN) and Naïve Bayes (NB), the batch size was with the volume of 100.

5 Results

Table 1 shows the result of accuracy (Recall for the danger of overfitting), F-Measure and Kappa statistics.

The Bayes Naïve model estimation is based on the Bayes Probability theory and outperformed the other two techniques on all model efficiency and also runtime. The effect of attribute reduction performed on preprocessing stage can be seen that 3–4 attributes are indifferent for our prediction models. On the other hand, the precision was not intended to be either/or with more than 99.9% correctness but rather the practically developed model with more than 60% accuracy. In the following table the confusion matrix is also indicated. The number of correct classified instances for "Yes" 100 and "No" was equal to 222.

```
=== Confusion Matrix ===
a   b   <-- classified as
100 110 |  a = Yes
68  222 |  b = No
```

Table 1 Data Scientific result performed in Weka

Attribute selection	Classifier	F-measure (%)	Kappa	Recall (%)	Accuracy (%)
12	Bayes Naïve (NB)	60.9	0.1931	61.0	61.8
	k-Nearest Neighbors (IBk)	50.12	−0.002	50.8	50.6
	Multilayer Perceptron (NNs)	53.9	0.0305	53.2	53.2
9	Bayes Naïve (NB)	52.2	0.0441	52.2	52.21
	k-Nearest Neighbors (IBk)	49.7	0.0324	51.6	51.57
	Multilayer Perceptron (NNs)	47.7	−0.044	47.8	47.7
6	Bayes Naïve (NB)	63.6	0.2486	64.4	64.4
	k-Nearest Neighbors (IBk)	57.2	0.1215	57.2	57.2
	Multilayer Perceptron (NNs)	53.2	0.0691	58.4	58.4

6 Discussion

Generally, for retailers or clothing stores, this result has fewer external consequences, though the point of view is very important due to the importance of feasibility of designing of such a smart system that can capture the customer sense and recommend a cloth for the customer. It is important for any brand as a beneficiary of a recommendation system to take advantage of opportunities and generally use chances and prevent failures in the competitive market, which will be created by differentiating in the mind of the customer. On the other word, this study could be the first evaluation of application of such framework in the stores which can be developed by the help of expert in fashion design and apparel entrepreneurship.

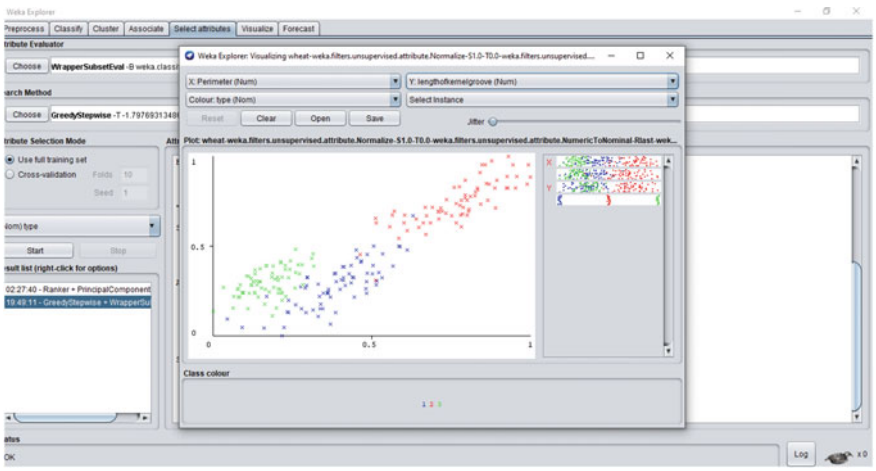
7 Conclusion

We have developed a framework that can model the sale recommendation for better communication between clients. We have firstly extracted the dataset from the UCI and then imported the data for the preprocessing into weka and python. The data was cleansed at the first step by the filtering tools embedded in Weka Application. Then the dataset was balanced to 50/50 distribution of target class for the danger of overfitting. Atlast, five different machine learning tools was implemented in the dataset to tune the hyper-parameter which resulted into more than 10% improvement

in the results. With the specific learning from the modeling, we understood that with the possibility of near 65% of success such a recommendation system can be applied.

Appendix [Python Code with Outputs]

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 210 entries, 0 to 209
Data columns (total 8 columns):
 #   Column              Non-Null Count  Dtype
---  ------              --------------  -----
 0   Area                210 non-null    float64
 1   Perimeter           210 non-null    float64
 2   Compactness         210 non-null    float64
 3   Lengthofkernel      210 non-null    float64
 4   Widthofkernel       210 non-null    float64
 5   Assymetrycoefficient 210 non-null   float64
 6   lengthofkernelgroove 210 non-null   float64
 7   type                210 non-null    int64
dtypes: float64(7), int64(1)
memory usage: 13.2 KB
Out[3]:
```



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Pricing Policies and Their Impact on Customer Satisfaction

Omar Jawabreh, Ra'ed Masa'deh, Yaqoub Bqaa'een, and Muhammad Alshurideh

Abstract This research aims to focus on pricing, policies and their impact on customer satisfaction in the five-star hotels in Aqaba. The technique that was used in the present research is described in this section. There are many components of this document: the research model, operational definitions of the study's independent and dependent variables, research hypotheses, as well as a data collection instrument, research population, and research sample. The components of this study are developed on the basis of prior literature, which may be either theoretical or empirical in nature. Indeed, the factors utilized in this research are often found in the literature on tourist development. The data analysis results have shown that services in restaurants in Aqaba hotels are applied at a very high level, which the mean score is 4.38. Also, customer satisfaction and pricing cognition (pricing) existed on a high base with mean of 3.86 and 3.74 respectively. Specifically, the research seeks to develop price policies for all categories and to work on the design of all pricing criteria to fit the quality of service and the degree of customer satisfaction, which shows that a high level of customer satisfaction may be achieved.

Keywords Services in restaurant · And pricing cognition (Pricing) · Customer satisfaction

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_138

1 Introduction

Being customer focused nowadays has to be accepted as a bare necessity to conduct business. Globalization and value-driven business imperatives will therefore mean that mistakes are not going to be tolerated; substandard products and services will ensure that the weakest are not going to continue competing; and fragile practices and poorly defined and managed processes will not be accepted (Jawabreh, 2020). Apart from anything else, true competitive advantage will only be established through excellence in customer value and the ensuing relentless care and attention provided. Customer satisfaction (CS) is a very often misused and abused expression. Many organizations use it casually in order to state that their customers are happy and satisfied with the levels of service rendered and the products and services purchased, but they actually have never tried to measure that satisfies. But if a company takes its customers seriously, it should not behave like this because the results of customer satisfaction measurements provide significant information for modern management processes and a warning signal about future business results. This enables an understanding of how customers perceive the organization, i.e., whether its performance meets their expectations, identifies priorities for improvement, benchmarks the performance of the organization against other organizations, and increase profits through improved customer loyalty. Through the process of creating a customer and supplier chain at all levels, a better focus can be achieved and, ultimately, all the work carried out will be of value. This customer–supplier communication will help to ensure quality and thus the customer's satisfaction (Al Khasawneh et al., 2021; Jawabreh, 2017; Jawabreh & Al Sarayreh, 2017; Lepkova & Žūkaitė-Jefimovienė, 2012).

For decades, the conception of trust has achieved appreciable implications in the field of marketing, not only for products as well as for services. When we have to make a choice between different products in the same category, trust is involved. It is an essential asset of a person, product, organization, institution, and skill. The buyer will go for the trustworthy asset mentioned above. Customer trust is an important variable that enhances customer commitment. He also stated that the quality of services enhances customer trust. Loyalty has, for years, been an important and fundamental ingredient of marketing. It has been a burning subject matter in marketing, not only for commerce academics, but also for industry managers (Qandah et al., 2020; Sarwar et al., 2012). For long-term success, organizations work very hard. The organizations' success is determined by numerous factors. Those organizations which earn lots of profit are not thought to be powerful organizations, because profit generation is one of the tasks of the organization. So, not just organizations now have to focus on shareholders, but also for customers, because now the customers are the king. In the existent world, maintaining the old ones and drawing the attention of new customers is considered to be a victory. Now the telecommunication sector is growing to be a vital sector of the world. Voice communication, graphics, data, and delivery of video at a very high speed are provided by the telecommunication sector. The world economy is being influenced by the telecommunication sector. Competition is going

to be more intense. For the purpose of achieving a maintained competitive edge, the telecommunication industries are compelled to pursue innovation and to execute the best thing for the satisfaction of their customers. So, the marketing relationship plays a vital part in the industry of telecommunication (Alrowwad et al., 2020; Mahmoud et al., 2021; Malik et al., 2012; Obeidat et al., 2019).

Much emphasis has been placed on revenue from the oil and gas industry, thereby leading to the neglect of other vital sectors of the economy, such as tourism, power, etc. It is based on this fact that the hospitality industry has really remained under-explored in Nigeria for too long as an alternative source of generating revenue. The operations of hotels and other tourist centers gave rise to the function of what we see today as the hospitality industry. The hospitality industry is an important variable in the affairs of a nation and, most recently, it has sprung up to be a viable fund-generating medium in Jordan. Tourist centers, to a great extent, tend to bring investors and tourists, both local and foreign, to these countries, which, in turn, helps to improve the productivity level of the nation. The hotels in an environment serve as residing and accommodating places for people. These tourists, investors, and leisure seekers stay in hotels for different reasons, ranging from business meetings, conferences, leisure, etc. The government, on the other hand, derives revenue from the taxes imposed on these hospitality centers, which they usefully utilize in other productive ventures (Abuhashesh et al., 2019; Akaegbu, 2013).

While customer relationship marketing may be a firm's important driver towards the satisfaction of its customers, switching barriers and price perceptions are also likely to influence retention. Recent research on switching barriers and pricing perceptions may have interaction effects on customer retention. If they are high, service firms may continue to retain customers even if they are not highly satisfied (Kyriazopoulos & Rounti, 2007). Customers' satisfaction with their purchase is a significant factor that leads business to success. In recent times, customer satisfaction has gained new attention within the context of the paradigm shift from transactional marketing to relationship marketing. Customers who are satisfied with a purchased product will buy the same product again, more often, and will also recommend it to others (Masadeh et al., 2019). Customer satisfaction is commonly related to two fundamental properties, including the customer's judgment of the quality of the product and his evaluation of the interaction experience he or she has had with the product provider. He sums this up when he states: "The key to customer retention is customer satisfaction." Even though it is agreed in the literature that price and quality have a high effect on customers' satisfaction, there is little empirical evidence exploring this relationship. Almost nothing is known about the human neural mechanisms through which they affect the decisions made by individuals (Dapkevicius & Melnikas, 2009).

Traders usually use various pricing tools and promotion policies to attract new customers and increase customer loyalty. It is surprising that pricing strategies have proved to be a fruitful research area for marketers. Marketing scientists have offered both theoretical and empirical estimates showing that for all types of consumers, different price policies are likely to attract. Although there are well-known reasons why a consumer selects a store, we know relatively little about how retailers choose

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pricing strategies because of the complexity of such a decision should take into account both consumer preferences and current and anticipated actions of rivals (Marinescu et al., 2010).

One important factor that has been considered in many exchange relationships is price, which is the financial value that is given out in exchange for a product. The literature on consumer studies regarding prices has argued that customers hold an internal reference price which serves as a standard against which newly encoded prices are compared. In consumer markets. Price and satisfaction, so far, only measured aspects of the financing. Although price satisfaction has a direct impact on consumer behavior and loyalty. Obviously, this increased loyalty can reduce the cost of switching customers to other brands and the use of marketing tools such as word of mouth. In today's competitive and turbulent environment, according to a new marketing philosophy, customer-oriented organizations focus on customers and look at things from the perspective of the customer. Thus, it is clear what the customer wants and then begins searching for their research (Hortamani et al., 2013). With increasing globalization, local retailers find themselves having to compete with large foreign players by targeting niche markets. To excel and flaunt as a market leader in an ultramodern era and a globalized world, organizations must strive to harvest from their marketing strategies, benchmarking and company quality policies. Ranking and selecting projects is a relatively common, yet often difficult, task. It is complicated because there is usually more than one dimension for measuring the impact of each criterion and more than one decision maker.

It's impossible for anyone to neglect the impact of the air transport business on the world economy. Sir Colin Marshal, the former CEO of British Airways, has described it as "the flywheel for the engines of the world's industry". According to the Air Transportation Action Group, the industry at the beginning of this decade produced more than €1.5 trillion worth of economic activities and employed directly and indirectly 57 million people. It is, furthermore, an essential element in the world transport network, as it is currently used by more than two and a half billion passengers per year, and ships around 35% of the world's manufactured products (by value). The industry has, therefore, turned from a sign of military and national power to a key element of business and investment. Technologically driven innovations have boosted the industry, but economic developments have had even more influence on the market (Jahmani et al., 2020; Jawabreh, 2021). Despite being faced with rising fuel prices, environmental concerns, and small margins, the airline business will still face an intensely competitive market (Al-Jabaly & Khraim, 2014).

The study aims to provide pricing policies for all categories and work on the design of all pricing requirements to suit the quality of service and customer satisfaction, which indicates reaching a high level of customer satisfaction.

2 Literature Review

Trust is the name of confidence and belief which a customer attaches to some organization and considers what he or she thinks should be delivered. Actually, trust is a relationship that attaches the customer to the company. Trust is also involved between the employees of an organization. The high level of trust between each other in multinational and multicultural organizations creates productive relationships, which, in the end, generates long-term benefits for the organizations (Alananzeh et al., 2019; Jawabreh et al., 2020). Basically, trust plays an important role in e-business. Because in the e-market, privacy and security are key elements to developing trust. Trust development is more suitable for trade when considering the business to consumer market. Even in store salesperson behavior influences building trustworthy relationships. Sales effectiveness ultimately increases the trust of customers. Salesperson behavior plays a vital role in trust building (Alshurideh et al., 2021; Masa'deh et al., 2018; Sarwar et al., 2012).

The restaurant service practitioner provides high-quality food and drink service to guests. A food service practitioner generally works in the commercial sector, offering a range of services to customers. There is a direct relationship between the nature and quality of the service required, and the payment made by the guest. Therefore, the practitioner has a continuing responsibility to work professionally and interactively with the guest in order to give satisfaction and thus maintain and grow the business. The Marketing Accountability Standards Board (MASB) endorses the definitions, purposes, and constructs of classes of measures that appear in Marketing Metrics as part of its ongoing Common Language in Marketing Project. In a survey of nearly 200 senior marketing managers, 71% responded that they found a customer satisfaction metric very useful in managing and monitoring their businesses. The pricing/marketing strategy is based on the theory that certain prices have a psychological impact. Retail prices are often expressed as "odd prices": a little less than a round number, e.g., $19.99 or £2.98. There's evidence that consumers tend to perceive "odd prices" as being significantly lower than they actually are, tending to round to the next lowest monetary unit (Jawabreh, 2020). Thus, prices such as $1.99 are associated with spending $1 rather than $2. The theory that drives this is that lower pricing such as this institutes greater demand than if consumers were perfectly rational. Psychological pricing is one cause of price points. In this context, customer retention is a burning issue. In this context, trustworthy customers facilitate the organization to achieve its core objective, even if the organization is a profit-making concern or a nonprofit organization. Retaining more customers and delighting them leads the customer to retention with the organization's products or services. Since mid-1990, customer retention has been a very beloved topic for researchers. Those companies who know about the value of customer retention invest in it even from their profit, because customer retention gives long-term benefits to the organization in return. That's why not only big organizations, but small firms care about retaining customers (Sarwar et al., 2012).

The building of brand image is also an important matter for service firms as it is a powerful determinant for product marketing. Brand image as "the brand relations retained in consumers' minds causes assumptions about a brand." According to Nel et al., (2018), the product brand image is negatively affected by brand expansion, but the negative effect is being reduced by the relationship between the original and expansion brands. The great fall in the brand image will occur due to the brand expansion if the supposed image and quality of the original brand is superior. There have been positive effects on the apparent quality of the brand, consumers' brand awareness, fit perceived by the consumer, and consumers' attitudes towards the expansion of the product brand image after the expansion. The behavioral study reveals that there is a positive effect of brand image on customer loyalty and dedication towards market offerings. The supposed quality of the expansion is being affected by the degree of the relationship between the corporate brand and the service extension, which, as a result, affects the corporate image, particularly for those corporate brands which have very high-rated images (Malik et al., 2012).

A marketing concept that encompasses a customer's impression, awareness, and/or consciousness about a company or its offerings. Perception is the process by which we select, organize, and interpret information inputs to create a meaningful picture of the world. Perception is very important because it affects customers' actual behavior. This is a concept that constantly arises when trying to evaluate customers' satisfaction. This is in view of checking how the customer perceives or rates the organization in terms of product, quality, pricing, and service delivery. It is a term frequently used to measure how well products/services supplied by a company meet or surpass customers' expectations. Evaluating customer perception regularly helps in managing and monitoring business progress. When a particular firm has loyal customers, it gains positive word-of-mouth marketing, which is both free and highly effective, but very disastrous if it is negative and disloyal. Customer perception is how your target market sees your product or service, and this can go a long way towards determining the success or failure of any business. For example, if a particular hotel has a reputation for having the best customer service as well as internet facilities, the general customer perception would be that you should go there if you need assured services. This sentiment could influence the hotel's ability to make a profit. When the customer makes his buying decision, he evaluates the benefits to be derived from a particular service/product and compares them with the cost (Akaegbu, 2013).

Companies win or lose based on what percentage of their customers they can keep. Success is largely about the retention of customers, which again depends on the CS level. It would be a great help to be able to comprehensively measure the quality of products and services by relating the measures of quality to real customer behavior. Some companies get feedback about CS through the percentage of complaints and some through non-systematic surveys, but some do not measure CS at all, because the system would not add anything useful and is very time-consuming. Due to the small size of the market, there is intense rivalry among different airlines companies in Jordan. This rivalry has taken the form of severe price competition, with airlines ruthlessly undercutting each other with fare promotions. The service the airlines sell (air transport) is pretty homogenous, and there is not much service differentiation.

Airlines strive to create customer loyalty by offering frequent flyer programs, but this competitive advantage is quickly eroded by almost all airlines offering such programs. At present, it is much easier for travelers to search around for the best price. In a small market like Jordan, intense competition can lead to excess seat capacity due to declining demand because of macro-economic factors, and the high fixed costs and low marginal costs make the airline industry very price competitive. This study will yield a better understanding of the factors that lead to customer satisfaction and the value they are looking for, and ultimately, perceived price fairness for the overall service obtained by them (Al-Jabaly & Khraim, 2014).

3 Research Methodology

This section provides the methodology applied in the current study. It consists of the research model, operational definitions of the study's independent and dependent variables, research hypotheses, besides data collection tool and research population and sample.

3.1 Research Model

The elements of this research are established based on preceding literature, either theoretically or empirically. Indeed, this study used variables that are common in tourism development literature. Figure 1 represents a model for the study that shows the independent variables, the dependent variable, and the proposed relationship between them.

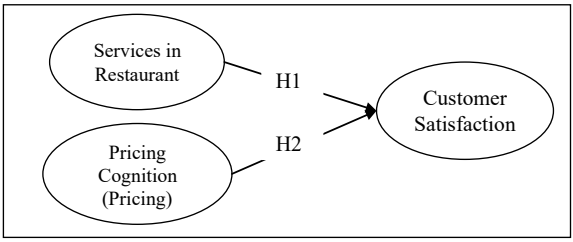

Fig. 1 Research model

3.2 Operational Definitions

Adapted from (Lepkova & Žūkaitė-Jefimovienė, 2012), the current research considers two independent variables (i.e., Services in Restaurant, and Pricing Cognition (Pricing)) which were measured in the research questionnaire through five items for each variable; one dependent variable (i.e., Customer Satisfaction) which is adapted from (Lepkova & Žūkaitė-Jefimovienė, 2012) and measured through five items.

3.3 Research Hypotheses

In order to test the research model, the study is hypothesized as follows:

H1: There is a significant relationship between Services in Restaurant and Customer Satisfaction.

H2: There is a significant relationship between Pricing Cognition (Pricing) and Customer Satisfaction.

3.4 Population and Sampling

The study population consisted of all spectrums of the community interested in tourism in Aqaba city includes all age levels (from 18 to 40 years and above). 1000 questionnaires were distributed and considered 600 of them for statistical analysis, thus the response rate was 60% which is high for the community of the city of Aqaba.

4 Data Analysis and Results

In order to examine the research hypotheses, in which these variables have been measured using 5-points Likert scale that varies between strongly disagree = 1 and strongly agree = 5. Also, reliability and validity analyses were conducted; descriptive analysis was used to describe the characteristic of sample and the respondent to the questionnaires besides the independent and dependent variables. Also, multiple regression analysis was employed to test the research hypotheses.

Table 1 The Cronbach's alpha coefficients of study variables

Variables	Number of items	Cronbach alpha
Services in restaurant	5	0.763
Pricing cognition (Pricing)	5	0.799
Customer satisfaction	5	0.812

4.1 Validity and Reliability

Validity and reliability are two important measures to determine the quality and usefulness of the primary data. Validity is about accuracy and whether the instrument measures what it is intended to measure while reliability is about precision; it is used to check the consistency and stability of the questionnaire. Indeed, the researchers depended on scales and items that were previously developed and used by other researchers with similar interest. Also, a draft of the questionnaire was formulated, and then it was reviewed by four academic lecturers—who have a sufficient knowledge and experience in this scope—to ensure that each item is measuring what is intended to be measured, and to avoid the ambiguity and complexity in the phrasing of questions. The reliability of the instrument was measured by the Cronbach's alpha coefficient. Further, some scholars (e.g., Bagozzi & Yi, 1988) suggested that the values of all indicators or dimensional scales should be above the recommended value of 0.60. Table 1 represents the results of Cranach's alpha for the independent and dependent variables. Cronbach's alpha coefficients of all the tested variables are above 0.60 which suggesting the composite measure is reliable.

4.2 Respondents Demographic Profile

As indicated in Table 2, the demographic profile of the respondents for this study showed that they are typically females, most of them between 20 and 30 years old, and the majorities' experiences between 3 and less than 10 years.

4.3 Descriptive Analysis

In order to describe the responses and thus the attitude of the respondents toward each question they were asked in the survey (Poh et al., 2012), the mean and the standard deviation were estimated. While the mean shows the central tendency of the data, the standard deviation measures the dispersion which offers an index of the spread or variability in the data (Sekaran & Bougie, 2013). In other words, a small standard deviation for a set of values reveals that these values are clustered closely about the mean or located close to it; a large standard deviation indicates the opposite. The level of each item was determined by the following formula: (highest point in

Table 2 Description of the respondents' demographic profiles

Category	Category	Frequency	Percentage (%)
Gender	Males	18	18.0
	Females	82	82.0
	Total	100	100
Age	20 years–less than 25	37	37.0
	25 years–less than 30	42	42.0
	30 years–less than 35	13	13.0
	More than 35 years old	8	8.0
	Total	100	100.0
Experience	1 years–less than 3 years	18	18.0
	3 years–less than 6 years	38	38.0
	6 years–less than 10 years	36	36.0
	Without experience	8	8.0
	Total	100	100

Likert scale − lowest point in Likert scale)/the number of the levels used = (5–1)/5 = 0.80, where 1–1.80 reflected by "very low", 1.81–2.60 reflected by "low", 2.61–3.40 reflected by "moderate", 3.41–4.20 reflected by "high", and 4.21–5 reflected by "very high". Then the items were being ordered based on their means. Tables 3 and 4 show the results.

As presented in Table 3, data analysis results have shown that services in restaurant in Aqaba hotels are applied to a very high level in which the mean score is 4.38. Also, customer satisfaction and pricing cognition (pricing) were existed in high bases with means of 3.86 and 3.74 respectively. Table 4 demonstrates the mean, standard

Table 3 Overall mean and standard deviation of the study's variables

Type of variable	Variables	Mean	Standard deviation	Level	Order
Independent variables	Services in restaurant	4.3860	0.58690	Very high	1
	Pricing cognition (Pricing)	3.7420	0.73816	High	2
Dependent variable	Customer satisfaction	3.8620	0.71220	High	

Table 4 Mean and standard deviation of the study's variables

Services in restaurant	Mean	SD	Level	Order
The food level is good in restaurants	4.59	0.698	Very high	1
Staff apply the rules of public safety in cooking	4.40	0.667	Very high	2
Use the latest cooking tools	4.34	0.819	Very high	3
Work as a team to reach a high level of service	4.33	0.817	Very high	4
Follow-up by officials on performance and productivity	4.27	1.043	Very high	5
Pricing cognition (Pricing)				
Pricing for marginal profit per unit or at the aggregate level	3.64	1.078	High	5
Pricing to achieve large volume sales with market spread	3.73	0.941	High	3
Pricing in order to stabilize the market and establish a stable mental image of the market for the products provided by the institution	3.68	0.952	High	4
Increase customer purchase rate for products on the market	3.78	0.960	High	2
Increase demand from non-users and win new customers	3.88	1.018	High	1
Customer satisfaction				
The food level fits the customer's satisfaction	4.00	0.953	High	1
The staff treat fits the customer's satisfaction	3.86	0.899	High	3
The prices are commensurate with the quality of service	3.82	0.936	High	4
Restaurants reach a high level of customer satisfaction	3.75	0.957	High	5
The meal speed is suitable for the customer	3.88	0.967	High	2

deviations, level, and order scores for services in restaurant and pricing cognition (pricing) toward customer satisfaction.

4.4 Hypotheses Testing Results

The current research is mainly seeking to investigate the impact of services in restaurant, and pricing cognition (pricing) toward customer satisfaction in Aqaba city in Jordan. Consequently, in order to test the hypotheses developed for this study, multiple regression technique was used. Further, the level of significance (α-level) was chosen to be 0.05 and the probability value (p-value) obtained from the statistical hypotheses test is considered to be the decision rule for rejecting the null hypotheses (Creswell, 2009). If the p-value is less than or equal to α-level, the null hypothesis will be rejected and the alternative hypothesis will be supported. However, if the p-value is greater than the α-level, the null hypothesis cannot be rejected and the alternative hypothesis will not be supported. In addition, normality of the independent variables and the absence of multi co-linearity problem (a case of multiple regression in which the independent variables are themselves highly correlated) were checked. According to (Pallant, 2005), most of the values should be inside the adequate ranges

Table 5 Skewness and VIF for the independent variables

Variables	Tolerance	VIF	Skewness
Services in restaurant	0.987	1.013	0.525
Pricing cognition (Pricing)	0.987	1.013	0.721

Table 6 Result for the study model[b]

Variable	r	R^2	F	Sig (f)	β	t	Sig (t)
Services in restaurant	0.536	0.287	19.561	0.000[a]	0.124	1.433	0.155
Pricing cognition (Pricing)					0.508	5.884	0.000

[a] Predictors: (Constant), Services in Restaurant, Pricing Cognition (Pricing)
[b] Dependent variable: Customer Satisfaction

for normality (i.e., −1.0 to +1.0). For this purpose, skewness and Variance Inflation Factor (VIF) were investigated; Table 5 includes the results.

As can be noticed from Table 5, the skewness values were within the normal values (−1.0 to +1.0) suggesting that the data of the independent variables is normal. The VIF values were less than the critical value (10) which is most common among the most studies, suggesting no multi co-linearity problem among the independent variables. However, the results of testing the two hypotheses on the impact of services in restaurant and pricing cognition (pricing) on customer satisfaction are demonstrated in Table 6.

Refer to Table 6 the multiple correlation coefficient $R = 0.536$ indicates that there is a positive correlation between the independent variables (services in the restaurant, and pricing cognition (pricing)) and customer satisfaction. The R2 indicated the generalizability of the model. It allows us to generalize the results taken from the respondents to the whole population. In this case it equals 0.287. The results showed that the F-ratio for these data is equal to 19.561, which is statistically significant at $p < 0.05$. Therefore, we conclude that there is a statistically significant impact of the independent variables on customer satisfaction.

The β indicates the individual contribution of each predictor (independent variable) to the model, if other predictors are held constant. Table 6 shows the standardized coefficients for each independent variable. The value of β for services in restaurant is 0.124 which has a small value. While for pricing cognition (pricing); the value of β is 0.508, which has a good value compared with another predictor. The level of effect of these variables depends on the β value, the higher β value, the higher effect on dependent variable. We can infer from the values of beta that the variable that has the highest contribution in the model is merely pricing cognition (pricing).

5 Discussion and Conclusions

In light of the results of the study answers questions and test hypotheses has been reached following results; the study results showed H1 was rejected whereas H2 was accepted by reference to the Table 6. In this study we aim to identify quality methods in restaurants, Focus on the core aspects of customer satisfaction and to develop cooking methods and staff development and give awareness sessions in all cooking styles and focus on all segments of society, because in general this leads to a high level of quality of pricing, service and development, which leads to increased customer satisfaction.

The findings of the data analysis revealed that services at restaurants in Aqaba hotels are provided at a very high level, with a mean score of 4.38 out of 5. Customer satisfaction and price cognition (pricing) were both found to be at high levels, with mean scores of 3.86 and 3.74, respectively, indicating high levels of both. Table 4 shows the mean, standard deviations, level, and order scores for services in a restaurant and price cognition (pricing) in relation to customer satisfaction in the restaurant industry. The multiple correlation coefficient $R = 0.536$ shows that there is a positive relationship between the independent variables (restaurant services and price cognition (pricing)) and customer satisfaction. The model's generalizability was shown by the R2 value. It enables us to extrapolate the findings obtained from the respondents to the whole population as a whole. In this particular instance, it equals 0.287. The findings revealed that the F-ratio for these data points is equal to 19.561, which is statistically significant at a 0.05 level of significance. As a result, we reach the conclusion that the independent factors have a statistically significant effect on customer satisfaction.

Customer retention is a hot topic globally, and trustworthy customers help organizations accomplish their goals, whether for profit or not. Retaining more consumers and making them happy contributes to customer retention. Since mid-1990, client retention has been a hot study subject. Because customer retention provides long-term advantages to the company, not just large organizations, but even small businesses worry about keeping consumers (Sarwar et al., 2012). Building a brand image is essential for service companies since it influences product marketing. This is because the brand image is "the brand relations maintained in customers' minds." According to (Nel et al., 2018), brand, expansion adversely impacts product brand image, although the impact is mitigated by the relationship between the original and expansion brands. Brand expansion will cause a significant loss in brand image if the original brand's image and quality are better. The product brand image has improved due to increased customer knowledge, perceived fit and consumer attitudes towards the expansion. The behavioral research shows that brand image has a beneficial impact on consumer loyalty and commitment to market offerings. The degree of connection between the corporate brand and service extension affects the perceived quality of the expansion and therefore the corporate image, especially for those corporate brands with high rated images (Abu Zayyad et al., 2021; Aljumah et al., 2021; Alshurideh, 2022; Alshurideh et al., 2015; Alwan & Alshurideh, 2022;

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ELSamen & Alshurideh, 2012; Hamadneh et al., 2021; Malik et al., 2012; Sweiss et al., 2021; Tariq et al., 2022).

Each predictor (independent variable specific) contribution to the model is represented by the symbol, assuming that all other predictors are kept constant. The standardized coefficients for each independent variable are shown in Table 6. Table 6 showed a little amount of money is spent on services at a restaurant, as shown by the figure of 0.124. Whereas, for pricing cognition (price), the value of the predictor is 0.508, which is an excellent value when compared to other predictors. The magnitude of the impact of these variables is determined by the value; the greater the value, the greater the effect on the dependent variable. Based on the values of beta, we may conclude that the variable that makes the most contribution to the model is simply pricing cognition (price discrimination) (pricing) (Alzoubi et al., 2020).

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The Impact of Changes in Oil Prices on the Global and Saudi Arabia Economy

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Abstract This study aimed to identify the impact of COVID-19 on oil sector which faced the significant challenges, globally and in Saudi Arabia. The study sheds light on the unprecedented crisis that occurred in the decline in demand for oil and the collapse of its prices, and its effects and consequences on world economies and Arab economies, and the extent to which the Saudi economy has been affected by them in light of what markets have witnessed global oil, and opportunities to benefit from this crisis and the study relied on the descriptive and analytical methodology. The study paper will use the NARDL to explain the asymmetric effect of changes in oil price on Government Budget for Saudi Arabia. The study reached that this situation provides a further opportunity for Saudi Arabia to diversify the economy away from a reliance on oil, Government policies seek to facing these challenges by diversifying the economic base and developing and diversifying revenues non-oil products to reduce financial volatility, in addition to enhancing the role of the private

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_139

sector focusing on supporting non-oil GDP growth rates to enhance the resilience of the economy.

Keywords Oil prices · Oil and gas sector crude oil futures · Global economy · Saudi Arabia

1 Introduction

The oil markets witnessed in April 2020 a historic event, where the prices of American light crude collapsed below zero, in an unprecedented event, and the world will remember them for a long time, which raises questions about how this happens and its meaning, those affected by it and the potential or expected effects after That and such prices. The Corona pandemic was not the main reason for the decline in oil demand and the collapse of its prices in the manner that occurred, but the last actions by oil producers was the reason for increasing pressure in a market that was previously suffering.

This decrease in oil prices (American crude) came in the context of the global downturn in the COVID -19 pandemic that struck the world's economies in a recession, causing the demand for points to drop by nearly a third, in addition to the disturbances that dominated the relations of OPEC members, After Russia withdrew from the Alliance of Oil Producers, which was aiming to balance the market, in early March 2020.

And where there are producing countries that produce oil, there are other countries that store only, and based on the agreement of the OPEC countries, the producing countries must maintain the equivalent of 90 days of oil reserves, to face any crisis, especially in times of war. However, it did not happen that the OPEC member countries kept this amount of reserves, until the COVID-19 pandemic came and caused the demand for oil to drop, and the rates of over storage increased dramatically—due to the oversupply increase to 35 million barrels per day. Exceeds the actual storage capacity in countries that do so.

In this context, this research paper attempts to shed light on this unprecedented crisis and its effects and consequences on the global economy, the extent to which the Saudi economy was affected by it and the opportunities to benefit from this crisis.

2 Literature Review

The oil and gas industry are experiencing its third price collapse in 12 years. After the first two shocks, the industry rebounded, and business as usual continued. This time is different. The current context combines a supply shock with an unprecedented demand drop and a global humanitarian crisis. Additionally, the sector's financial and structural health is worse than in previous crises. The advent of shale, excessive

supply, and generous financial markets that overlooked the limited capital discipline have all contributed to poor returns. Today, with prices touching 30-year lows, and accelerating societal pressure, executives' sense that change is inevitable. The COVID-19 crisis accelerates what was already shaping up to be one of the industry's most transformative moments.

The pandemic is first and foremost a humanitarian challenge, as well as an unprecedented economic one. The industry has responded with a Herculean effort to successfully and safely operate essential assets in this challenging time. The current crisis will have a profound impact on the industry, both short and long term. How radically the oil and gas ecosystem will reconfigure, and when, will depend on potential supply–demand outcomes and the actions of other stakeholders, such as governments, regulators, and investors. In any scenario, however, we argue that the unprecedented crisis will be a catalytic moment and accelerate permanent shifts in the industry's ecosystem, with new future opportunities.

Taking bold action during the crisis to secure resilience and accelerated repositioning Hard questions, indeed. In the meantime, winners will accept the crisis for what it is: a chance to form their own views of the future and to lead to capture new opportunities. Leaders will adopt tailored strategies that fit within their specific environment and markets in which they choose to compete, and the capabilities they bring (such as low-cost production, regional-gas or downstream-oil market leadership, value-chain integration, and specialized strengths in for example retail, trading, and distribution). In our view, all companies should act boldly on five themes, consistent with their chosen strategy: Reshape the portfolio, and radically reallocate capital to the highest-return opportunities, Take bold M&A moves, Unlock a step-change in performance and cost competitiveness through re-imagining the operating model, Ensure supply-chain resilience through redefining strategic partnership approaches, Create the Organization of the Future, in both talent and structure (Al-Jarrah et al., 2012; Assad & Alshurideh, 2020; Barbosa et al., 2020).

Aloui et al. (2020) indicated that on 12 March 2020, the sharp fell of U.S. crude oil price to 30 dollars was explained by the outspreads of coronavirus pandemic and the OPEC's inability to reach a production quota agreement. We employ the structural VAR model with time-varying coefficients and stochastic volatility (TVP-SVAR model) developed by (Primiceri, 2005) to assess the impact of COVID-19 shocks on the energy futures markets, particularly on crude oil and natural gas S&P GS Indexes. The findings confirm that energy commodities S&P GS Indexes respond to COVID-19 shock that varying over time due to fundamentals factors as well as behavioral and psychological factors.

Using a TVP-SVAR with a stochastic volatility model, they investigate the impact of COVID-19 on the commodity futures market. First, we show the importance of investors' expectations in future commodity price dynamics. Speculators in the futures markets anticipate price movements which caused high stochastic volatility during the period that precedes the huge increase in the number of deaths. Then, we show that commodity responses to COVID-19 shock varied from one period to another. The determinants likely to explain the dynamics of the SP GSCI Crude oil index and SP GSCI natural gas index face the COVID-19 include fundamental

factors as well as financial factors. In fact, the fall in oil futures prices is partly due to a structural imbalance between supply and demand, particularly a strong decreasing of energy demand following the COVID 19 in large emerging countries such as China and an oil shock caused by disagreements between the Organization of the Petroleum Exporting Countries (OPEC) and Russia, triggering the drop in oil spot prices. In addition, the spread of the virus in the USA negatively impacted the commodity futures market. On the other side, based on behavioral finance theorist, the commodity indices fluctuations are linked to the investors' expectations. In fact, during the crisis, speculators operating on a purely financial logic, turned to the commodity markets to increase their returns which lead to a slight increase in commodity futures index during stock market crash. The short-term outlook for the commodity futures market will depend on the efficiency of government policy to contain the COVID-19 outbreak, and to weaken the impact of the global health crisis has on economic activity.

Recently many studies investigated COVID-19's impact on global economic activity (Ahmad et al., 2021; Al-Dmour et al., 2021; Alameeri et al., 2021; Aljumah et al., 2021; Alshurideh et al., 2021; Harahsheh et al., 2021; Shah et al., 2021). Yilmazkuday (2022) by using daily data on the global coronavirus disease 2019 (COVID-19) deaths, shows that the effect of COVID-19 deaths is insignificant, and explained the plunge of oil price in March 2020 by the OPEC disagreement. In the same line of work, Musa et al. (2020) investigates the impact of coronavirus outbreak on the global energy demand by using daily data on China's population, currency Chinese exchange rate, and international crude oil prices, from 23rd January to 8th February 2020. The result revealed that the total population has a positive and significant impact on total coronavirus infected cases while the crude oil price is negative and significantly related to the coronavirus infected cases.

3 Oil Production (American Crude) and OPEC Countries and Oil Prices in the Period 2011–2020

Oil prices ranged 2012–2020 between $110 in 2011 and below the dollar per barrel in 2020, decreased in 2015 and ranged to $80 and below $30 per barrel until 2020. It is worth noting that there are two types of American crude Both are used as a benchmark for setting world oil prices:

- **The first type**: West Texas Intermediate (WTI) oil. It is extracted from oil fields in the United States, especially from Texas, Louisiana and North Dakota, and then transported via a pipeline to Cushing, Oklahoma, for delivery. WTI is used as the benchmark for determining the price of oil in North America.
- **The second type**: Brent Crude, extracted from oil fields in the North Sea, which is a mixture of four crude oils, but collectively referred to as "Brent Crude Oil (Wingfield et al., 2020).

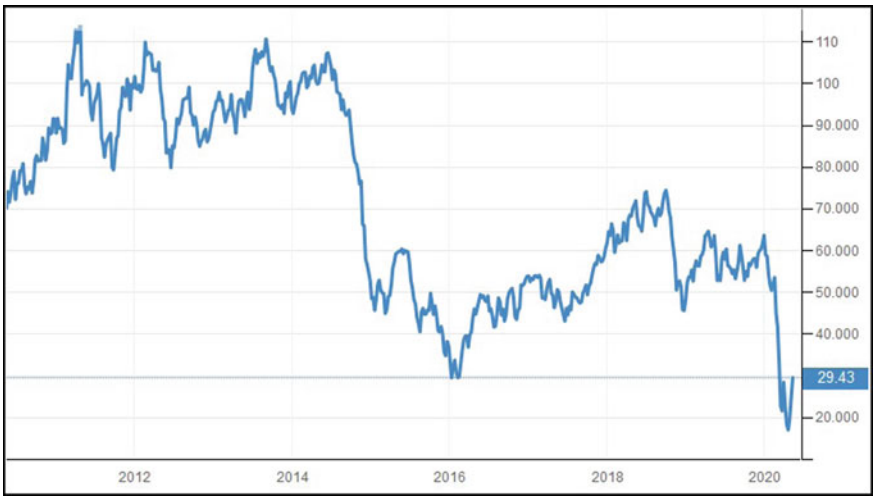

Fig. 1 Oil prices (Brent crude) in the period 2011–2020 (dollars per barrel). *Source* tradingeconomies.com (2020)

- Brent crude is the most traded globally and is used as a standard for global pricing and measurement. Brent crude and West Texas are classified as relatively light oils (Energy, 2020) (Fig. 1).

These prices mentioned in the previous figure refer to the prices of American crude (Brent), as it is considered the main reference for oil prices and purchases in the world Major Benchmark Price for purchases of oil worldwide. Brent prices have fallen to nearly $20, compared to previous years, when they reached the ceiling of $100 a barrel. As for the oil whose price has reached below zero (37-), it is WTI, as shown in the following figure (Amadeo, 2021) (Fig. 2).

West Texas Intermediate was trading at a higher price than Brent crude, and due to the revolution in shale oil production in the United States in early 2000, along with more imports to the United States from Canada, the price of WTI decreased, and it is now usually trading at a price Low on Brent. But in general, there are no major differences between the prices of Brent crude and West Texas crude, as shown in the following figure in the last five months. It also indicates the decrease of WTI prices to below zero last April and then returning to rise again, but below the levels recorded in the months Previous (Sharma, 2020) (Fig. 3).

The total oil production in the world is between 100 and 105 million barrels per day, of which 41–43 million barrels are produced by OPEC countries daily. OPEC controls approximately 75% of the total crude oil reserves in the world and produces 42% of the total crude oil production in the world.

Before the Corona pandemic, the supply of oil was greater than the demand for it (global demand = 90 million barrels per day), equivalent to 12–15 million barrels per day. Since the United States is the largest producer and consumer, as well as an importer of oil in the world, producing close to 12 million barrels per day, until

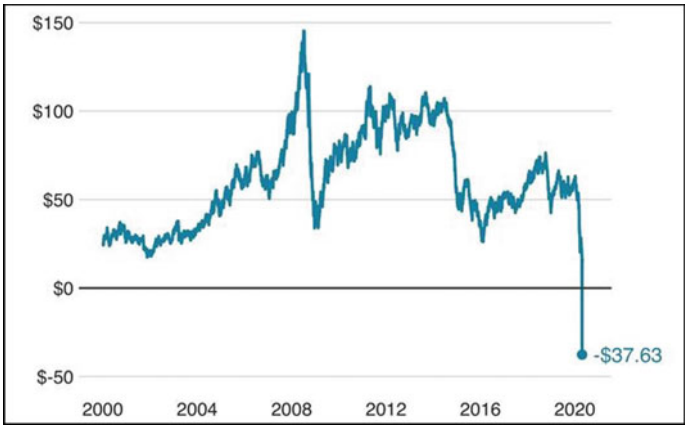

Fig. 2 US WTI crude price collapse below zero in April 2020. *Source* Bloomberg, 27 April 2020

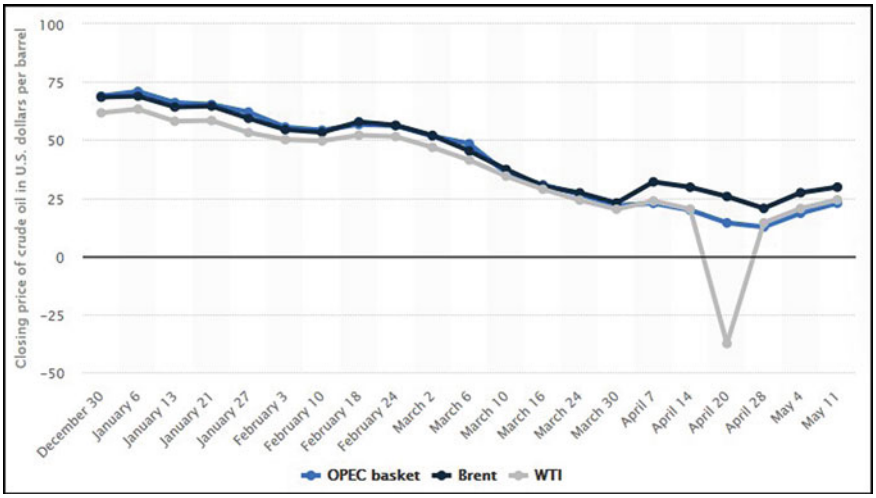

Fig. 3 Oil prices for: Brent, OPEC basket, and WTI from December 2019 to May 2020. *Source* www.statista.com

2012, it used to import about 5 million barrels per day from all over the world. but as of that year, the United States began to rely on "shale gas and shale oil", and paid attention to everything related to extractive industry to not fall under the pressure of the oil producing countries. Since that time, American oil production increased to reach 13 million barrels per day in early 2020, after it was only 8 million barrels in 2014, as shown in the following figure (Sönnichsen, 2020) (Fig. 4).

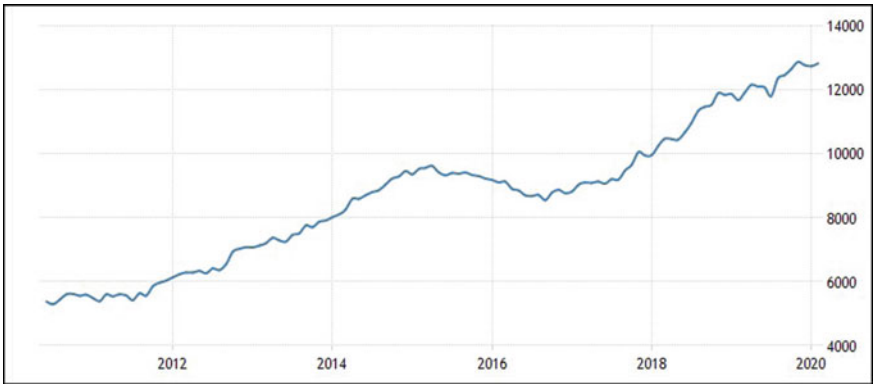

Fig. 4 The development of American crude production in the period 2011–2020 (thousand barrels). *Source* tradingeconomies.com 2020, U.S. Energy Information administration

4 Reasons for the Recent Sudden Collapse of Oil Prices in Late April 2020?

When the world invaded the newly emerging epidemic of 19-COVID, countries did not think that a comprehensive ban would be imposed in all sectors and at all levels in the manner we are witnessing today, but the United States did not expect the pandemic to extend to it in this way and cause economic life to stop in all Countries of the world, and as a result, the demand for oil decreased significantly.

If we look at Kuwait and the Kingdom of Saudi Arabia as two countries that depend on oil and its exports at 90% of their national product for each of them, and assuming that Saudi Arabia exports 3 million barrels per day, their value before 2016 was approximately $400 million, and today their value is only $120 million, meaning that A loss of $300 million per day and $9 billion per month that would harm the Saudi economy, likewise in Arab economies dependent on oil.

The value of futures contracts for US crude fell unprecedentedly, as the price of a barrel fell to minus $37, the lowest level since the beginning of the sale of futures contracts in 1983, which are obligated to sell a specific product at a specific date at specific prices, which has increased the economic pressures that it suffers from during Corona pandemic.

In a deeper view of the American crude market, the buying and selling in the oil market is not done on quantities on time. Rather, there is a circulation of buying and selling contracts between speculators who do not obtain oil in kind, but rather seek to achieve profits only through trading in contracts.

Because of the state of closure and stagnation that prevailed in the world due to the Corona pandemic, a crisis of surplus oil production was generated, while Saudi Arabia and Russia continued to pump large quantities to the market, and with the decrease in demand to stop the movement of air, land and sea navigation, contract

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holders were no longer able to Sell them, not even able to take the oil drums they had previously bought, because storage places have reached their maximum limits.

Regarding the contracts that are traded on the oil market, there are 3 types of contracts:

- Long-term contracts
- Medium-term contracts
- Spot contracts.

The long-term contracts are known to be the least expensive, then medium-term, where prices increase slightly, and the last spot contracts are the most expensive, as they represent the urgent need. Also, there are three oil exchanges in the world in which these contracts are traded:

- West Texas Stock Exchange
- Brent Stock Exchange
- Gulf Stock Exchange.

In the first type (West Texas) contracts were concluded in May 2020 until 20 April 2020. On the Brent Stock Exchange, June contracts were concluded at $25 a barrel, and May contracts closed at $23, with an outlook for July of $30 a barrel. the Gulf Stock Exchange, May, June and July contracts were concluded without any storage problems.

The problem of storage appeared in the United States only, and it became difficult to receive any additional quantities from oil producers, and the cost of storage until June became equivalent to $40 a barrel per month, while the cost of producing a barrel is only $25, Thus, the cost of storage in two months is $80 per barrel.

To get out of this deadlock, which is called the loss-lose situation, which is the worst situation the world has reached, the offer to sell for $0 would be better, in order to avoid the cost of storage for two months ($80 per barrel), which happened on Monday, 20 April 2020, but It was required that the sale be negative, meaning that each barrel added 37 dollars, which is better than the product costing 80 dollars storage per barrel/two months. Thus, this solution was to discard WTI stock.

Not all the Brent and Gulf stock exchanges were exposed to this problem, as Gulf oil is directly to the refining markets in India, Korea and Japan, and these markets was far from the oil market turmoil in North America.

Oil prices often change, and prices are affected by a wide range of factors, the most important of which are:

- Increase or decrease in supply by oil producers.
- Increase or decrease in demand by oil users and importers.
- Subsidies to oil companies or other energy companies.
- International policy (agreements concluded between countries).
- The internal policy of oil producers.
- Oil supply worldwide.
- Competition from other energy sources.
- Geopolitical disturbances, pressures, and insecurity (leads to an increase in prices).

the global oil price curve will rise in light of:

- The tendency to reduce production due to lower demand, and hence a decrease in the amount of surplus or stock.
- The return of economic and air to work in most countries of the world, as the weakness of the global economy has an adverse effect that would reduce the demand for oil.

The price of a barrel of oil will rise to $40–$60, which is the fair price of oil after adding variable costs to the production cost, which is estimated at $23 a barrel, while variable costs range between $15 and $25 a barrel and selling at any price below that constitutes Loss of the product. Also, the lower price than the fair price pushes small producers (whose production ranges between 7 and 10 million barrels per day) out of the market (Aloui et al., 2020).

5 The Impact of the 19-COVID Pandemic on the world's Economies

Before examining the economic effects of changes in the oil market and its prices on the global economies and the Saudi economy in particular, it is necessary to identify the most important effects of the Corona pandemic through exposure to the most important economic indicators summarized in the following table to know the impact of the pandemic on economic performance in those countries (Soïnichsen, 2021) (Table 1).

When looking at the indicators it is necessary to look at them somewhat conservatively, especially indicators of Saudi, because these indicators were calculated by the end of the fiscal year in June 2019, and not in December 2019 as in other countries. That is, the impact of the COVID-19 pandemic has not yet appeared in economic indicators, Noting that there is an estimate of some indicators for some countries that were calculated in the first quarter of 2020, which makes them appear somewhat deteriorated, as shown in the unemployment rate in the United States (14.7%), the growth rate in China (−6.8%), The growth rate in the euro area (−3.2%), in addition to the increase in the ratio of public debt to gross domestic product in countries that achieved negative growth at the end of the first quarter of this year (*Trading Economies*, n.d.).

If we look at, for example, the rate of unemployment in Saudi Arabia and its development in the period July 2017–January 2020, we find that it has made remarkable progress at the last estimate of 5.7%, as shown in the following figure (Fig. 5):

Table 1 Some economic indicators in some economies in 2018/2019

The indicator Country	The growth rate economic (%)	The interest rate (%)	The rate of inflation (%)	The unemployment rate (%)	Budget deficit (%)	Public debt/GDP (%)
United State	0.3	0.25	0.3	14.7	−4.60	106.90
China	−6.8	3.85	3.3	6	−2.80	50.50
Euro-zone	−3.2	0.0	0.3	7.4	−0.60	84.10
Japan	−2	−0.10	0.1	2.5	−3.80	238.20
United Kingdom	−1.6	0.10	0.8	3.9	−1.80	80.80
India	4.7	4	5.84	7.8	−3.34	69.62
Brazil	1.7	3	2.4	12.2	−5.90	75.79
Russia	1.6	5.5	3.1	4.7	1.80	14.60
Canada	1.5	0.25	−0.2	13	−0.70	89.70
South Korea	1.3	0.75	0.1	3.8	−1.60	36.60
Saudi	**−0.3**	**1.0**	**1.3**	**5.7**	**−9.20**	**19.10**
UAE	1.6	1.5	−1.9	2.64	−0.80	18.60
Egypt	5.6	9.25	5.9	7.7	−8.00	90.00
Singapore	−2.2	0.09	0.0	2.4	−0.30	126.30
Iran	1.8	18	19.8	10.4	−4.40	44.20
South Africa	−0.5	3.75	4.1	29.1	−6.30	62.20%

Source TRADINGECONOMIES (2020) https://tradingeconomics.com/

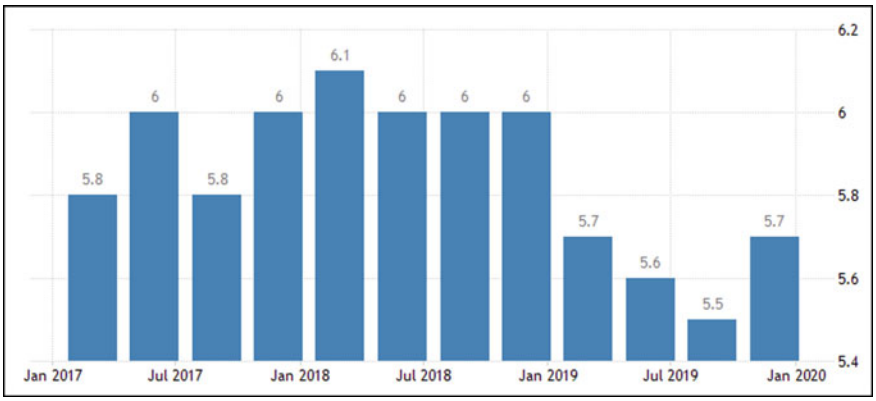

Fig. 5 The unemployment rate in Saudi Arabia (January 2017–January 2020). *Source* tradingeconomies.com 2020, CAPMAS, Saudi Arabia

6 The Expected Effects of Changes in the Oil Market and Its Prices on Arab and Saudi Economies During Corona Pandemic

It is noted in recent years that the world is on the way to reducing dependence on oil as an energy source, and therefore has a direct negative impact on oil prices. But at the same time, oil remains an irreplaceable source of energy in many areas with other sources of energy. The natural resources that exist in the world, such as minerals, timber, and textiles, will not be enough for the inhabitants of the earth at one time, so the alternative is "the petrochemical industry".

Therefore, we find the policy of Arab countries, including the Gulf states, especially Saudi Arabia, to establish a number of advanced refineries to encourage the manufacturing industry by relying on oil, and then export those products and move as far as possible from the export of oil as crude.

we can say that the Arab common market and the creation of an integrative market among the countries of the region is a real opportunity, and Arab economies should work in this direction, because it will achieve a great added value that is not comparable to that generated from the export of crude oil.

Demand for oil declined due to the emerging Corona Virus "Covid–19", which pushed the price of oil down, and consequently, the Kingdom's oil revenues decreased to increase the fiscal deficit with it.

Demand for oil has fallen historically due to the emerging Corona Virus "Covid-19", which caused the oil price crash to an unprecedented degree. Government oil revenues decreased in the first quarter of 2020 by 24.0% from the same quarter of the previous year, to record 129.0 billion Saudi riyals. This was accompanied by increased expenditures, bringing the budget deficit in the first quarter of 2020 to 34.1 billion Saudi. With the weak expectations of oil demand continuing until the end of 2020, due to the decline in economic activities, high financial spending and decreased financial revenues, we expect the Kingdom to record this year the largest historical deficit in its budget. Early estimates are that the Kingdom's budget deficit will range between 420 and 370 billion Saudi riyals. The longer the epidemic spreads, the greater the impact on the economy.

7 Model and Methodology

The study tries to investigate the short-run and long-run asymmetric effect of oil price changes on the aspects of the government budget in Saudi Arabia. The study uses the nonlinear ARDL approach.

The asymmetric integration interrelationship can be written in the following form:

$$y_t = \gamma^+ z_t^+ + \gamma^- z_t^- + \varepsilon_t \tag{1}$$

where y_t is the dependent series, z_t^+ and z_t^- are the partial summation of negative and positive developments in z_t, and ε_t is the error component. In addition, γ^+ and γ^- measure the long run asymmetric impact for positive and negative changes respectively.

$$z_t^- = \sum_{i=1}^{t} \Delta z_i^- = \sum_{i=1}^{t} \max(\Delta z_i, 0) \tag{2}$$

$$z_t^+ = \sum_{i=1}^{t} \Delta z_i^+ = \sum_{i=1}^{t} \max(\Delta z_i, 0)) \tag{3}$$

Therefore, the asymmetric effect of oil price changes on the different aspects of government budget can be expressed as follows:

$$y_t = \rho y_{t-1} + \sum_{k=0}^{p-1} \vartheta_k^+ OP_t^+ + \sum_{k=0}^{p-1} \vartheta_k^- OP_t^- + \sum_{k=1}^{p-1} \varphi_{yk} \Delta y_{t-k} + \sum_{k=1}^{q} \varphi_k^+ \Delta OP_t^+ + \sum_{k=1}^{q} \varphi_k^- \Delta OP_t^- + \varepsilon_t \tag{4}$$

where, 'y_t represents the different aspects of public budget, ε_t reflects the error component, $\gamma^+ = -\vartheta^+/\rho$ and $\gamma^+ = -\vartheta^+/\rho$ reflect the asymmetric long run coefficients.

In order to check for the existence of the cointegration relation in (4), we will follow (Shin et al., 2014) and (Sims et al., 1982) by utilizing the Pesaran (2001)'s cointegration bound (F_{pss}) test (Pesaran et al., 2001). Which depends on F test. F_{pss} based on the null hypothesis that there is no cointegration in the underlying relationship; it means the joint summation for the long run coefficients are equal to zero or $\rho = \vartheta^+ = \vartheta^- = 0$. Therefore, refusing the null hypothesis means that the existence of the long run cointegration in the underlying relationship. Moreover, usual Wald test can by utilized to test for the asymmetry in short and long run relationship.

Data

The paper explores the hypothesis that changes in the crude oil price would have a considerable impact on government budget, total government expenditure, current government expenditure, capital government expenditure, total government revenue, and the ratio of surplus or deficit to the GDP in Saudi Arabia. The data covers annual data for the years 1990 to 2020 for West Texas Intermediate crude oil price, total government expenditure, current government expenditure, capital government expenditure, total government revenue, and the ratio of surplus or deficit to the GDP. The dataset is captured from IFS and the General Authority for Statistics in Saudi Arabia (Ministry of Finance, 2020b).

Table 2 shows the descriptive statistics for the raw data of the utilized variables where Table 3 depicts unit root tests for the variables. The ARDL model has one condition is that employed series are integrated of order I(0) or I(1) and it is not allowed to be integrated of order I(2). We depend on Augmented Dickey Fuller test to check for the unit root. As it is shown in Table 3, all variables are stationary in the level of the first difference and there is no any series is stationary in the second difference; which means it is appropriate to apply ARDL model.

Table 4 depicts the results of the linear ARDL for the effect of oil price changes on a public budget. The first and the second column show that over the long run changes in total government revenue is significantly affected by its first lag, the level and the lag of oil price. Over the short run, a change in total government revenue is significantly affected by changes in its lag and changes in the level oil price changes. In addition, the cointegration term is negative and significant which means the relationship is stable.

Table 4 shows estimates for current government expenditure, capital government expenditure, and total government expenditure. Over the long run, current government expenditure is considerably affected by its lag and the level of oil price where over the long run it is significantly determined by changes in its lag and changes in

Table 2 Descriptive statistics for variables

	OP	TGR	TGX	CGX	CPGX	DCGDP
Mean	33.13043	335,243.2	315,143.7	227,375.8	87,767.87	1.610638
Median	20.82000	205,500.0	221,272.0	162,350.0	54,652.00	−2.600000
Maximum	110.2200	1,247,398	1,109,903	739,658.0	370,245.0	43.20000
Minimum	1.300000	7940.000	6293.000	3989.000	2304.000	−25.30000
Std. Dev	29.88969	332,748.2	278,764.6	196,192.7	91,699.93	14.65213
Skewness	1.410193	1.470927	1.416078	1.217659	1.404911	0.802962
Kurtosis	3.904577	4.091775	4.026157	3.551291	4.148236	3.699688
Jarque–Bera	17.18013	19.28269	17.77012	12.20960	18.04320	6.009254
Probability	0.000186	0.000065	0.000138	0.002232	0.000121	0.049557
Observations	47	47	47	47	47	47

Table 3 Unit root results

	I(0)		I(1)	
	Z(t)	P-value	Z(t)	P-value
OP	−1.566	0.4913	−5.936	0.000
TGR	−1.758	0.3957	−7.576	0.000
CEXP	−0.431857	0.8948	−8.698	0.000
CPEXP	−1.019	0.7387	−5.972	0.000
CDGDP	−2.564	0.107	−6.897	0.000

Table 4 Results of the linear ARDL of oil price on the public budget

Total government revenue D(TGR)		Current government expenditure (CGE_t)		Capital government expenditure (PGE_t)		Total government expenditure TGE		The ratio of surplus or deficit to GDP (RGDP)	
C	4.521 (0.001)***	C	2.658 (0.000)***	C	7.879 (0.000)***	C	4.8718 (0.006)***	C	−1.783 (0.717)
TGR_{t-1}	0.5076 (0.001)***	CGE_{t-1}	0.7086 (0.000)***	PGE_{t-1}	0.489 (0.028)**	TGE_{t-1}	0.525 (0.000)	$RGDP_{t-1}$	0.511 (0.000)***
OP_t	0.995967 (0.000)***	OP_t	0.971(0.000)***	OP_t	0.995 (0.013)**	OP_t	0.290 (0.0251)	OP_t	23.14 (0.000)***
OP_{t-1}	0.5059 (0.002)***	OP_{t-1}	0.104 (0.484)	OP_{t-1}	0.09 (0.877)	OP_{t-1}	0.316 (0.008)***	OP_{t-1}	−19.88 (0.000)***
D(TGR_{t-1})	−0.232 (0.2984)	D(CGE_{t-1})	−0.1772 (0.541)	$D(PGE_{t-1})$	0.0183 (0.034)**	$D(TGE_{t-1})$	0.484 (0.009)	$D(RGDP_{t-1})$	−0.0111 (0.9513)
D(OP_t)	1.021 (0.000)***	D(OP_t)	0.283 (0.000)***	D (OP_t)	0.378 (0.07)*	D(OP_t)	0.290 (0.025)**	D(OP_t)	23.14 (0.000)***
D(OP_{t-1})	0.1692 (0.4662)	D(OP_{t-1})	0.181 (0.227)	D(OP_{t-1})	0.163 (0.675)	D(OP_{t-1})	−0.04 (0.81)	D(OP_{t-1})	3.173 (0.55)
ECT_{t-1}	−0.492 (0.001)	ECT_{t-1}	−0.291)0.000)***	ECT_{t-1}	−0.38 (0.010)**	ECT_{t-1}	−0.504 (0.000)***	ECT_{t-1}	−0.488 (0.000)***
Adjusted R^2	0.945	Adjusted R^2	0.954	Adjusted R^2	0.628	Adjusted R^2	0.956	Adjusted R^2	0.709
F-statistic	260.08 (0.000)***	F-statistic	472.25 (0.000)***	F-statistic	19.17 (0.000)	F-statistic	328.1 (0.00)	F-statistic	27.90 (0.000)***
D.W	2.19	D.W	2.181	D.W	1.855	D.W	1.98	D.W	2.06
Q-statistic	0.5750 (0.448)	Q-statistic	0.1563 (0.693)	Q-statistic	0.0270 (0.987)	Q-statistic	0.012 (0.913)	Q-statistic	0.057 (0.810)

(continued)

Table 4 (continued)

Total government revenue D(TGR)		Current government expenditure (CGE_t)		Capital government expenditure (PGE_t)		Total government expenditure TGE		The ratio of surplus or deficit to GDP (RGDP)	
Heteroscedasticity	1.612441 (0.2008)	Heteroscedasticity	1.789 (0.150)	Heteroscedasticity	1.143 (0.374)	Heteroscedasticity	0.775 (0.514)	Heteroscedasticity	0.775 (0.514)
Serial correlation	0.986 (0.3817)	Serial correlation	1.595 (0.216)	Serial correlation	0.2844 (0.755)	Serial correlation	0.32 (0.72)	Serial correlation	0.320 (0.72)
Ramsey reset	1.309 (0.2591)	Ramsey reset	2.273 (0.1398)	Ramsey reset	0.397 (0.695)	Ramsey reset	1.15 (0.28)	Ramsey reset	1.154 (0.2889)

*** Reflects the coefficient is significant with probabilities 1%, 5%, 10%; ** the coefficient is significant with probabilities 5%, 10%; * the coefficient is significant with probability 10%

oil price. Further, Table 4 shows that capital government expenditure is significantly affected by its lag and the leg of oil price over the long run. However, over the short run, capital government expenditure is significantly determined by changes in its lag and changes in the level of oil price. Furthermore, Table 4 reveals that total government expenditure is significantly affected by its lag, level of oil price and the first lag of oil price. On another hand, over the short run, total government expenditure is significantly affected by changes in its lag and changes in the level of oil price.

Table 4 presents the results for the deficit or the surplus of government budget as a ratio of GDP. It can be observed that over the long run RGDP is significantly determined by its lag, the level of oil price and the lag of oil price. However, over the short run, RGDP is significantly determined by changes in oil price.

Table 5 depicts the estimates for the asymmetric effect of oil price changes on the government budget. The first two columns show factors that effect on total government revenues, we can observe that over the long run total revenues is significantly affected by its lag, positive and also negative shocks of oil price. However, the effect of positive socks is stronger than negative shocks. Over the short run, the total revenue is considerably only affected by changes in negative oil price shocks. Moreover, the cointegration term is negative and significant which reflects the stability of cointegration relationship.

Table 5 shows the current government expenditure is significantly affected by its lag and the negative oil price shocks. Further, current government expenditure is significantly affected by positive and negative oil price shocks. However, the effect of positive shocks is more obvious than negative shocks. On the other hand, capital government expenditure is significantly affected by its lag and positive oil price shocks over the long run. In addition, capital government expenditure is mainly determined by changes in its lag, changes in the level of positive oil price shocks and the changes in negative oil price shocks. Furthermore, the total government expenditure is mainly determined by its lag, the level of positive oil price shocks and the lag of positive oil price shocks. Contrary, the total government expenditure is significantly affected by changes in its lag, changes in the level and in the lag of positive oil price shocks.

Table 5 presents the results of the asymmetric effect of oil price changes on the ratio of surplus or deficit in the public budget to the GDP. It can be observed that this ratio is considerably affected by its lag, the level of negative and positive shocks of oil price and the lag of positive shocks. However, the ratio of the surplus or deficit to GDP is significantly affected by changes in positive shocks and changes in the lag of changes in negative shocks.

In sum, our results support the asymmetric effect of oil price shocks on different aspects of public budget in Saudi Arabia. This is confirmed by the results of Wald test which refer to rejecting the null hypothesis over the short run and long run for the majority of the underlying models.

Table 5 Results of the non-linear ARDL of oil price on the public budget

Total government revenue D(TGR)		Current government expenditure (CGE_t)		Capital government expenditure (PGE_t)		Total government expenditure tge		The ratio of surplus or deficit to GDP (RGDP)	
C	2.758 (0.25)	C	3.805 (0.000)***	C	1.27 (0.52)	C	6.06 (0.00)***	C	2.46 (0.58)
ρ	0.559 (0.00)***	ρ	0.597 (0.000)***	ρ	0.623 (0.000)***	ρ	0.704 (0.00)***	ρ	0.337 (0.016)**
ϑ_0^+	1.50 (0.00)**	ϑ^+	0.156 (0.39)	ϑ^+	1.148 (0.039)**	ϑ^+	0.821 (0.00)***	ϑ^+	35.82 (0.00)***
ϑ_0^-	0.67 (0.00)**	ϑ^-	0.228 (0.02)**	ϑ^-	0.131 (0.719)	ϑ^-	−0.148 (0.484)	ϑ^-	19.198 (0.00)***
ϑ_1^+	−0.875 (0.11)	ϑ_1^+	0.171 (0.41)	ϑ_1^+	0.081 (0.91)	ϑ_1^+	−0.474 (0.04)**	ϑ_1^+	−41.96 (0.00)***
ϑ_1^-	−0.262 (0.41)	ϑ_1^-	−0.004 (0.988)	ϑ_1^-	0.774 (0.422)	ϑ_1^-	−0.082 (0.76)	ϑ_1^-	7.25 (0.34)
φ_{y1})	−0.206 (0.35)	φ_{y1})	−0.092 (0.60)	φ_{y1})	−0.298 (0.03)**	φ_{y1})	−0.25 (0.074)*	φ_{y1})	−0.08 (0.58)
φ_0^+	1.503 (0.00)	φ_0^+	2.658 (0.000)***	φ_0^+	1.148 (0.039)**	φ_0^+	0.821 (0.00)***	φ_0^+	35.8 (0.00)***
φ_0^-	0.673 (0.00)***	φ_0^-	0.283 (0.00)***	φ_0^-	0.131 (0.719)	φ_0^-	−0.148 (0.48)	φ_0^-	−1.78 (0.75)
φ_1^+	−0.021 (0.95)	φ_1^+	−0.065 (0.81)	φ_1^+	1.195 (0.024)**	φ_1^+	0.474 (0.0441)**	φ_1^+	−2.2 (0.74)
φ_1^-	−0.045 (0.89)	φ_1^-	0.069 (0.83)	φ_1^-	−1.15 (0.29)	φ_1^-	−0.482 (0.109)	φ_1^-	30.40 (0.00)***
$\vartheta_k^+ = \vartheta_k^-$	6.49 (0.015)**	$\vartheta_k^+ = \vartheta_k^-$	8.46 (0.006)***	$\vartheta_k^+ = \vartheta_k^-$	4.865 (0.03)**	$\vartheta_k^+ = \vartheta_k^-$	4.689 (0.0401)**	$\vartheta_k^+ = \vartheta_k^-$	7.90 (0.008)***

(continued)

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Table 5 (continued)

Total government revenue D(TGR)		Current government expenditure (CGE_t)		Capital government expenditure (PGE_t)		Total government expenditure tge		The ratio of surplus or deficit to GDP (RGDP)	
$\varphi_k^+ = \varphi_k^-$	15.13 (0.00)***	$\varphi_k^+ = \varphi_k^-$	4.29 (0.045)	$\varphi_k^+ = \varphi_k^-$	4.97 (0.036)**	$\varphi_k^+ = \varphi_k^-$	17.41 (0.00)***	$\varphi_k^+ = \varphi_k^-$	3.27 (0.051)*
ECT_{t-1}	−0.306 (0.022)**	ECT_{t-1}	−0.29 (0.002)***	ECT_{t-1}	−0.078 (0.071)*	ECT_{t-1}	−0.043 (0.021)**	ECT_{t-1}	−0.407 (0.00)***
Adjusted R^2	0.945	Adjusted R^2	0.955	Adjusted R^2	0.671	Adjusted R^2	0.92	Adjusted R^2	0.84
F-statistic	41.73 (0.00)***	F-statistic	241.19 (0.000)***	F-statistic	6.71 (0.000)***	F-statistic	31.47 (0.00)***	F-statistic	21.2 (0.00)***
D.W	2.01	D.W	2.02	D.W	2.02	D.W	1.86	D.W	2.1
Q-statistic	6.471 (0.89)	Q-statistic	6.75 (0.87)	Q-statistic	10.329 (0.568)	Q-statistic	11.14 (0.431)	Q-statistic	16.147 (0.185)
Heteroscedasticity	0.596 (0.856)	Heteroscedasticity	0.525 (0.71)	Heteroscedasticity	1.73 (0.12)	Heteroscedasticity	1.243 (0.305)	Heteroscedasticity	0.505 (0.92)
Serial correlation	0.34 (0.715)	Serial correlation	0.51 (0.60)	Serial correlation	1.60 (0.216)	Serial correlation	0.655 (0.528)	Serial correlation	0.622 (0.544)
Ramsey reset	0.520 (0.478)	Ramsey reset	0.420 (0.52)	Ramsey reset	0.647 (0.426)	Ramsey reset	2.30 (0.142)	Ramsey reset	2.19 (0.3)

*** Reflects the coefficient is significant with probabilities 1%, 5%, 10%; ** the coefficient is significant with probabilities 5%, 10%; * the coefficient is significant with probability 10%

8 How Did Saudi Arabia Face This Price Crisis in the Oil Market?

The Kingdom and the oil-exporting countries are experiencing many challenges, as restricting oil production and developments on the supply side are other negative effects added to the slowdown in the growth of the global economy, which affects price stability and thus affect the ability of financial planning for countries. Oil markets witnessed great fluctuations during the year 2019, as Brent crude prices achieved their lowest levels in January at 2.53 dollars a barrel, and its highest levels in April, to reach $9.74 a barrel.

The Kingdom, through its oil policy, seeks to stabilize the global market. Crude Oil, which balances the interests of producers and consumers together and provides the right environment for sustainable growth in the global economy through its active leadership role in commitment in quotas agreed in accordance with the OPEC agreement. Government policies also seek to facing these challenges through diversification of the economic base and developing and diversifying revenues from mon-oil resources to reduce the volatility of financial flows, in addition to strengthening the role of the private sector Emphasis is placed on supporting non-oil GDP growth rates to enhance the economy's resilience (Ministry of Finance, 2020a).

The following are important points that can be taken into account when such crises occur and minimize their negative effects on the Saudi market.

- Encouraging the manufacturing industry and stopping the export of oil or gas in its raw form.
- Relying on alternative sources of electric power generation, which is a global trend sought by different countries of the world, and has many positive consequences and effects, the most important of which is reducing pollution rates. Evidence for this is that the low dependence on petroleum products and the consequent stoppages of flights and land and the stopping of many factories worldwide have had the greatest impact in reducing pollution rates in the world by rates that reached 25%.
- Working to form a fully supply chain in the Arab region, and to use the crude oil produced in one country to produce finished goods in another country and then export them abroad(Barbosa et al., 2020).
- Forming a moderate axis by the oil-producing Arab countries, and not aligned with the Chinese or American poles, considering the global power imbalance. Power is not only a military force, but there is an economic force that will not be achieved in the Arab region except by integration between the countries of the region to form one economic force that produces what is needed and exports what others need (Fig. 6).

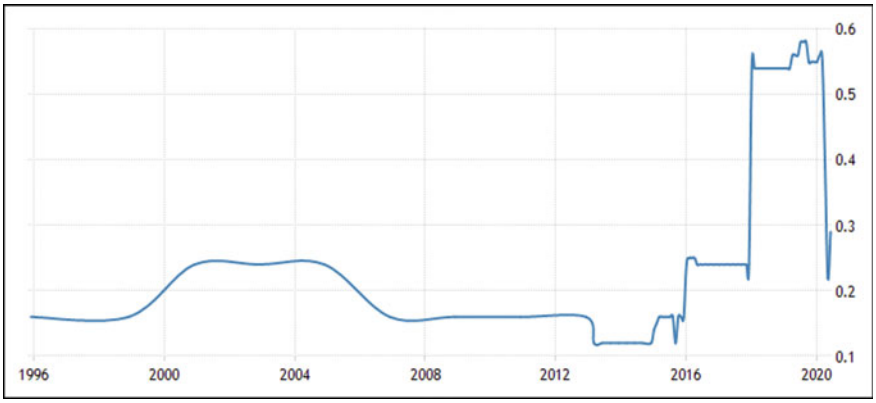

Fig. 6 Saudi Arabia Gasoline Prices. *Source* https://tradingeconomics.com/Saudi Arabia/gasoline-prices

9 Saudi Arabia Reforms of Energy Products Prices (Increasing the Efficiency of Government Support)

- The Kingdom has been providing energy products to local consumers at a subsidized price and much less. Of their prices when exporting. The difference between the price of a product domestically and its price when exporting represents the cost of an alternative opportunity per barrel of oil or the benefits that the domestic consumer acquires from the subsidized price.
- The value of government support for energy and water products in 2015 was approximately (300) billion Saudi riyals, based on the export price of energy products at that time. The value of subsidies can increase significantly over time due to the rapid growth of domestic consumption of energy and water products and changes in the export prices of energy products. Subsidized prices also contribute to stimulating rapid growth in the consumption of state resources.
- The Kingdom relies on oil and non-renewable natural resources as a main source of income, and therefore it is not possible in the long run to continue consuming these resources locally in this unfair form and at subsidized prices.

The Kingdom aims to adjust the prices of energy products as the cost of the alternative opportunity wastes on the Kingdom the opportunity to collect the optimum price for its natural resources, and therefore to use those lost revenue in investment in other sectors to achieve economic diversification and provide various benefits for the residential and non-residential sectors.

10 Conclusion

In this study we presented and shed light on unprecedented crisis for the oil industry which generated from the COVID-19 pandemic demand disruption, and a supply surplus. The oil sector is witnessed its third price collapse in 12 years. After the first two shocks, but this time is different. This one combines a supply shock with an unprecedented demand drop and a global humanitarian crisis. The depth and duration of this crisis are uncertain, this crisis will have a deep impact on the industry, both short and long term. We think, it will be difficult to return to the attractive industry performance without fundamental change. In the Short-term scenarios for supply, demand, and prices we expected oil prices could recover in 2021 or 2022 to pre-crisis levels of $50/bbl to $60/bbl. We think it will be two years before demand recovers, with the outlook for jet fuel particularly bleak. The immediate effects are already staggering companies must figure out how to deal with full storage, prices falling below cash costs for some operators. We think in the long run the macro-environment will become more challenging and we predict growth in demand for oil, to peak in the 2030s, and then begin a slow decline.

The challenge of the energy transition will continue. Saudi Arabia must begin a new age and change in its strategy, where the industry will be entering an era defined by intense competition, technology-led rapid supply response, flat to declining demand. The unprecedented crisis will be a catalytic moment and accelerate permanent shifts in the industry's ecosystem, with new future opportunities.

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IoT Applications in Business and Marketing During the Coronavirus Pandemic

Muhammad Turki Alshurideh, Barween Al Kurdi, Salaheddin Saleh, Karim Massoud, and Abdullah Osama

Abstract The internet of things (IoT) is a widely used technology in day-to-day life and in many business fields. the applications of IoT are used in many businesses and in marketing as main part of business activities, but during the coronavirus pandemic, IoT was intensively used, as a practical solution to many challenges. In this paper, the use of IoT is discussed generally in business such as in supply chain and logistics, human resources management, and in organizational performance. The paper will also tackle the use of IoT in both marketing and business activities and finally discussing some of the limitations and challenges businesses face when implementing IoT.

1 Introduction

The coronavirus pandemic has necessitated changes in organizational management. Thus, the pandemic has revealed the aspects pertaining to the management of companies and its efficiency. Furthermore, its effect has echoed the need for greater engagement between businesses and their consumers. As a result of the pandemic, community changes have become the key factor necessitating provision of new organizational management models. One of the key areas that organizational management

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_140

has had a chance to integrate is using the internet of things (IoT) (Friedow et al., 2018a).

The Internet of Things (IoT) devices and applications are utilized in several fields (Nasajpour et al., Dec. 2020) as it offers a great chance for businesses to have an influential model for tackling and managing several aspects of business such as monitoring customers' needs, measuring business performance, marketing, and business processes; thus, making IoT the key tool in, defining management roles and potential improvement reaching down to the level of monitoring physical engagement of employees. Notably, the coronavirus pandemic has provided an insight into using IoT applications in the management of organizations.

2 What is IoT or IoE (Internet of Thing or Internet of Everything)

The Internet of Things (IoT), also known as the Internet of Everything or the Industrial Internet, is basically the interconnection of machines and devices through a network or internet that enables their communication (Lee & Lee, 2015). The communication happens through sensors by sending and receiving information without the direct involvement of a human being (Ranger, 2020). This communication uses Radio Frequency Identification (RFID), in which information systems will be invisibly embedded in the environment around us (Gubbi et al., 2013). The history of this machine-to-machine communication started in 1843 when a sensor was put on the clouds transmitting data every half-hour to predict the weather patterns (J.-F. (JF) Fava-Verde and S. Forster 2017). Another example used nowadays is a smartwatch. As it monitors the movement of the person wearing it, it automatically collects information such as steps walked, calories burnt, and even sleeping patterns, without the direct input by the person.

3 The Applications of IoT in Business

IoT has a significant impact on several aspects of life and behavior of individuals and on businesses. From the business perspective, using IoT has greatly impacted automation, business processes and logistic (Atzori et al., Oct. 2010). IoT devices and applications include robots, drones, smartphone applications, and wearables. They were significantly utilized during the coronavirus pandemic (Nasajpour et al., Dec. 2020) as they were used for data collection and generation. The application of IoT in the form of sensors in different locations of a smart building for example, are used for collecting and managing data from different parts of the smart building. The data produced from each sensor would be collected and saved through a cloud server. Then, it will be managed through a remote device such as a mobile, functioning

through a mesh of network by IoT technology. The purpose of collecting these data in smart building, is to promote energy-friendly smart buildings which would also be called Green Smart Buildings (Plageras et al., May 2018). In addition, data collection was extensively used during the coronavirus pandemic. Drones were to collect data for crowd monitoring and smartphone applications were used to capture data of people of close contact such as the duration of contact (Nasajpour et al., Dec. 2020).

Notably, during the use of IoT technology, it was seen to reduce maintenance costs. For instance, a study was done in a hospital in the UAE that presented a Predictive Maintenance (PdM) approach in which it works to monitor the equipment, predict, and classify healthy vs faulty parts thus enhance their performance. Moreover, they have proved how IoT technology is important in the economic sector as their approach caused up to 25% repair cost savings and functioned as an investment payback period of a year. In addition, deploying IoT along with other technologies was found to have a chance in providing the e-health system at high availability, accessibility, performance, with low maintenance cost (Shamayleh et al., 2020).

3.1 IoT in Supply Chain

Businesses use IoT to help managing supply chain and saving on inventory management activities. The application of IoT in companies helps create relevance in dealing with the supply and demands. Hence, the use of IoT in companies pertains to the designed operations and functionality elements (Kumar et al., 2020). In this case, IoT helps companies to maintain costs through tracking the use of smart devices. The application of smart solutions for printers, is another example of operating cost reduction (Nasajpour et al., Dec. 2020). In addition, in its application in the supply chain, IoT supports smart inventory management by collecting data and helps companies use right steps in assigning suppliers, retailers, and even managing employee activities. Inventory management of companies using IoT is less tedious to use, as it assigns roles for every party and increases the chances of attaining higher efficiency level. Similarly, the inventory management role of the IoT simplifies conducting logistic modeling for the companies (Nasajpour et al., Dec. 2020). Moreover, the use of IoT marks a chance to align and integrate the community's functional segments to specific organizational objectives. Hence, IoT enables companies have better management of their supply chain framework, logistics, and job assignment platforms. Therefore, integration of these functional areas marks the chance to use the IoT in managing organizational functions and increasing effectiveness of company operations (Nasajpour et al., Dec. 2020). It also offers, for example, a chance for companies to use smart tagging solutions to create a relevant model of tracking location of their products. IoT, in this sense, brings in an easier alternative for business to respond to the needs of the consumers when delivering goods. Nonetheless, it also increases the company's chances for saving on costs and marking the channel to grow. These advantages increase the demand for IOT in companies, particularly, in the times of pandemic. Hence, IoT contributes to ensuring efficiency of management

and identification of proper avenues to target the organizational growth (Kumar et al., 2020).

3.2 Organizational Performance

IoT application will increase the chances and capacity to attain better performance for companies. The use of IoT in companies provides market analysis and information from consumers. Thus, IoT real-time data will help companies gain an increased role over the consumer demands. Therefore, the IoT will help business institutions to pinpoint the best activities and implement relevant changes to cater for their customers' needs. Similarly, IoT application will appease the required level of addressing the needs of the consumers and target all parties' demands. Likewise, the use of IoT in conducting logistic management and customer service will increase efficiency of company operations (Friedow et al., 2018b). Thus, IoT will ensure an increased capacity and ability of the company to target the consumers' demands as well as to structure the company operations to attend them. Managing the logistics will bring out a high level of engagement with the consumers. Moreover, the use of the customer service model will ensure the company has an adequate level of connection with the consumers as well as can focus on appreciating demands of the stakeholders within the community (Nasajpour et al., 2020).

Another application of IoT is truck telematics, where it was utilized to better understand, and improve driving behaviors. Remote control centers monitor live sensor data from the company's fleet of vehicles, capturing speed, location, braking, and engine data. The gathered data is used to enhance future training programs. A combination of truck telematics and geo-information are being used to enable proactive alerts to be sent to drivers regarding possible upcoming hazards. Camera-based technologies have been adopted to improve driver safety, and fatigue management, capturing evidence of important driving events, improve truck routing, recommend optimal fuel purchasing times/locations, and forecasting predictive and proactive maintenance schedules. Improvements in utilization and routing have the potential to reduce traffic congestion, which is responsible for losses in productivity, increases in fuel consumption, air pollution and noise, and can incite stress, aggression, anger, and unsafe behaviors in drivers. Predictive analytics, which generate refueling and maintenance schedules, have the potential to be adopted by all vehicle manufacturers, and could generate reductions in customer fuel costs, whilst improving the performance, efficiency, and life expectancy of future motor all vehicles (Hopkins & Hawking, 2018) (Jianli, 2012). Furthermore, automated tracking integrates the communication of IoT devices with blockchain, which play a role in monitoring products and automating the tracking and clearance processes (Augusto et al., 2019).

3.3 IoT and Customer Service Management

Similarly, IoT can be applied in companies when executing customer service. The use of customer service bots in companies reduces the need for hiring physical experts to handle the customers. Nonetheless, this application also relates to the chance and capacity to integrate 24–7-h service for customers. In its turn, the use of the IoT bots to instruct a better customer service model encourages identifying and highlighting the steps to handle through the IoT advancement within the company. In effect, the IoT customer service bots ensure efficiency of the customers' engagement and proper organizational connection with the market. Hence, the use of IoT in the customer service segment boosts company image (Friedow et al., 2018b).

3.4 IoT and Human Resources Management

IoT helps companies save on the employment costs by eliminating the need to hire more employees or performing the roles that were carried by individual employees. For example, bigger companies employ baristas in their canteens and cleaners. The application of IoT technology provides smart solutions to these roles. Thus, cleaning activities can be replaced with smart vacuums that would activate as pre-programmed. Consequently, IoT will reduce the costs of paying the employees to perform cleaning services and increase the efficiency of cleaning services (Friedow et al., 2018b). In their turn, smart coffee-machines will help increase work efficiency of the employees and save servicing time as they may offer pre-programmed solutions to every employee's drink preference. Smart coffee makers are, therefore, a beneficial solution to increase the level of productivity among employees. Thus, the use of IoT will ensure a better level of managing the company's activities (Friedow et al., 2018b).

3.5 Environmental and Energy Conservation

IoT helps companies to ensure environmental conservation through temperature control within the premises. The use of IoT smart technology helps to set the optimal temperatures for the office thermostats and can be used in creating office heat map. Therefore, IoT helps in reducing energy costs in companies through introduction of new effective ways of handling environmental and energy needs. Another example is the use of intelligence lighting as it contributes to energy conservation. As intelligent lighting is programmed to light only at specific hours, reduces the maintenance costs that the company must conduct on its energy sources (Hussain, 2017).

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3.6 Data Security Management

IoT maintains the data management function of companies in various models, such as data learning and data integration. It also provides smarter security options for configuring appropriate steps and channels to handle security breaches in companies. The use of IoT is instrumental in identifying the core levels of handling the security needs of databases and server rooms as well as detecting real-time threats and mitigating them before causing harm to anyone. Integration of the smart security system on a company platform ensures increased relevance and potential to engage the company's best segments in safety management (Kumar et al., 2020). Therefore, the IoT security management system is a key factor in ensuring safety in technological networks and platforms within the companies. To this end, the IoT helps in appealing to a company's core segments by providing security and handling information provided to all company members. Real-time data from IoT helps define the channels of threat, deploy solutions to mitigate the threat, achieve best outcomes and manage provision of instructions to the company employees.(Nasajpour et al., Dec. 2020).

3.7 Organizational Management and Decision Making

IoT assists in increasing the organizational capacity to make informed decisions. The IoT plays a key role in designation of values and provision of decisions to meet the company's demands. In using IoT, companies look into data and have new insights into carrying out their activities (Nasajpour et al., Dec. 2020). The role designates an increased chance to affiliate and works with the elements of valuing community changes. IoT is considered a major factor in informing the companies on better ways to carry out their activities, as it emphasizes the weak points of the companies and defines the ways they can achieve efficiency (Friedow et al., 2018b). To enumerate, IoT looks into industry trends and ways that the company's activities suit the trends (Kumar et al., 2020). In cases, where the application of IoT does not lead to better handling of the trends, the institutions can challenge their models and decide on better ways that would elevate their performance. Besides, the IoT helps select the best practices within companies and analyze at the statistics of dealing with the organizational needs to achieve the optimal outcome in every operation carried out (Hussain, 2017). Hence, IoT helps companies to attend to core demands and requirements through improved management model.

In addition, IoT helps managers to establish the best channel of working towards addressing pertinent issues in times of pandemic. By obtaining information from the market segments, the customer behavior models, and industry trends, managers would be directed towards data-driven decision -making. Notably, real-time information will also increase efficiency of the managers. For instance, the use of realistic levels of attending to employee demands in the pandemic and instructing remote

working capacities will increase the overall company performance (Friedow et al., 2018b). Thus, regarding the employees work from home, the company's management will be able to efficiently designate duties and ensure the employees can meet the set deadlines. Equally important, IoT can help company management to address the pertinent trends and issues that offer value to their activities. In this sense, a company will relate to industry trends and begin working, for example, on e-commerce platforms. Most companies applied e-commerce as an avenue to maintain contact with their customers during the pandemic. Restriction of movement and reduced working hours has rendered e-commerce platform more appealing to most customers. Thus, IoT application and the use of insights from the industry helped to ensure an effective and impactful integration of activities (Friedow et al., 2018b).

3.8 Workplace Sanitation

The coronavirus pandemic has indicated the increased need for cleanliness and sanitation within workplaces and public environments. The use of IoT was able to assist in the automation of these functions to ensure exclusion of the employees' services, thus ensure health security of the latter. Automation of the cleaning and hygiene functions increased the role of IoT and the structural engagement of companies to confer with the community's demands and the pandemic sanitation requirements (Kumar et al., 2020). To demonstrate, IoT automation can be used to operate workplace fumigation and sanitizer dispensers. These machines will fumigate the workplace to ensure the place is free from bacteria and viruses. Increased application of the automated service will ensure dispensation of liquid sanitizers to employers, when they get in and out of the workplace, as the machine will be measuring their temperature. Application of IoT will create a sufficient level of ease of use and relevance for the employees. Thus, the use of IoT in companies will ensure compliance with health and sanitation regulations and reduce the risk of employees becoming sick (Kumar et al., 2020).

4 IoT Applications in Marketing and Advertising

There are many applications of marking using IoT. Some examples of these applications are contextual advertising: With the wide spread of smartphones, targeted advertising using IoT applications could be easily done by sends pop-up ads to the customers and informing them with promotions or offers. Another application is in-store advertising which is done by using an electronic device called "beacon" to send ads and notifications to customers' smartphones when they are in or nearby the store. In addition, location-based advertisement by using GPS on smartphones, ads or activities within a certain range could be sent to customers. Another commonly used application is targeting customers by collecting data about a customer's preference or behavior then sending smart ads based on the collected data every time the

customer goes online. IoT is also used in interactive marketing with high potential of opportunities, such as using interactive smart mirrors that enable customers to try on clothes only by looking at the mirror and without wearing them. Another example is using QR codes to open a menu or use them for a discount (Hashem, 2021).

4.1 Customer Behavior Analysis

Another area of IoT application in businesses is ensuring proper level of attending to customer needs. The use of IoT attracts insights into customer behavior and changes within the customer segment (Hussain, 2017). In this sense, IoT facilitates identification and definition of optimal steps to handle customers' requirements. The application of IoT provides an opportunity to integrate company values and mitigate the challenges related to satisfying customer needs across all segments. Thus, the use of IoT ensures an increasing application of value in a company's operations. IoT management of consumer data is a key factor in depicting organizational actions and activities in the market segment. IoT establishes a sustainable channel of advancing the needs of the company by defining the best activities to conduct at any given moment.(Kumar et al., 2020).

4.2 IoT and Customer Relationship Management (CRM)

Data-driven marketing is a success factor in customer relationship management (CRM), thus utilizing all sorts of data collected from different sources including ones from IoT, help in predicting customers' needs and behavior, design marketing plans that fit predictions, personalizing marketing campaigns and advertisements, and increase the accuracy of decision-making process and data driven marketing strategies. The relationship between IoT and CRM could be summarized by: IoT provides decision making capabilities, data collection and exchange, marketing management, and by providing customers with rich experiences and high level of personalized interaction. These factors are connected directly to better CRM leading to better marketing management. (Hashem, 2021).

4.3 IoT Applications in Customer Service and Support

Manufacturing companies operate in an environment characterized as increasingly volatile, uncertain, complex, and ambiguous. At the same time, customers' orientation makes it increasingly important to ensure high delivery reliability. A concept to connect supply network and manufacturing more closely by integrating events from the supply network into manufacturing control's decisions. This approach enables an

effective and efficient response to events from the supply network through smarter manufacturing control, and thus more resilient manufacturing (Bauer & Bauernhansl, 2021).

4.4 IoT and Product/Service Support

IoT can be helpful in the products support when it comes to supply and demand management. In the supply management, operations at the manufacturing companies can be a bit of a mess if not handled properly. The more complex the operation, the more attention and monitoring it requires. IoT comes in hand in introducing concepts that would connect supply network with manufacturing decisions (Bauer et al., Mar. 2021).

5 Limitations and Challenges

The use of IoT has several limitations and challenges that needs to be taken into consideration: Privacy and secrecy concerns: Since IoT is all about gathering all sorts of data which could be accessed by hackers, thus could be causing security threats and breaches depending on the type of data and information collected. This requires the adoption of technology that is designed to prevent information leakage and the implementation of network guards and firewalls ((Hashem, 2021; Razzak, 2012)). Data interpretation: It is equally important to note that the companies should consider the bulk of data generated and to design proper processes to handle it terms of processing, storage, and interpreting it in a useful manner such as in the field of marketing (Hashem, 2021).Cyber threats: due to the interconnection of IoT devices, the network could be facing a security attack by malware or worm.

Unsolicited intrusions: Leaked data could take place while transferring it through IoT, thus security protocols should be adopted to protect private. Loss of jobs: Since IoT is considered an efficient and effective automation process, it could replace many jobs due to its capabilities and accuracy (Razzak, 2012).

6 Conclusion

To conclude, IoT technology has a powerful impact on day-to-day life and on businesses in many aspects (Ghazal et al., 2021a)-(Lee et al., 2022). As seen in this paper, the applications of IoT varies from minor daily tasks to major strategic decisions and from simple process automation to transformative innovations which were all evident during the coronavirus pandemic. Since the adoption of this technology along with other technologies is inevitable, businesses are required to benefit from

its applications in achieving goals and competitive advantage (Al Kurdi et al., 2020)-(Tariq et al., 2022). Therefore, setting the right implementation methodology is a must especially with consideration to challenges such as privacy and social impact.

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Impact of Workplace Happiness on the Employee Creativity: A Systematic Review

Shamsa Alketbi and Muhammad Alshurideh

Abstract This study examines the antecedents of workplace happiness and how the later impact the employees' performances and their levels of creativity. Based on our literature review, researcher identified four main potential drivers of workplace happiness, namely, leadership style, work environment, compensation and opportunities for learning and personal development.

Keywords Workplace happiness · Work environment · Leadership · Compensation · Opportunities for learning and personal development · Employees' performance · Employees' creativity

1 Introduction

Systematic reviews are types of literature reviews that collect and critically analyze multiple research studies or papers, using methods that are selected before one or me research questions are formulated, and then finding and analyzing studies that relate to and answer those questions in a structured methodology.

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M. Alshurideh et al. (eds.), *The Effect of Information Technology on Business and Marketing Intelligence Systems*, Studies in Computational Intelligence 1056,
https://doi.org/10.1007/978-3-031-12382-5_141

2 Problem Statement

Happiness is very important nowadays, especially in United Arab Emirates, as we know UAE is a rapid and growth country, which contains a various number of nationalities. Who came from different cultures, so we need to keep in mind the importance of keeping those nationalities happy with us in order to give us a wide range of creative ideas as well as perform in best way? The competition in the business environment has been increasing over time. At present, organisations have a large number of rivals, in every market and industry (Chandrasekar, 2011). This rivalry and competition have made it impossible for organisations to afford to waste the potential of their human resources and workforce. Several factors come together to determine the workplace environment suitability for employees. For instance, organisations, in the modern era, are promoting new programs for employees which address issues such as health, fitness, work-life balance, lifestyle changes, and other benefits so that the employees perceive their work environment as favourable (Chandrasekar, 2011).

Even some organisations have introduced policies such as performance-based salaries, motivation programmers, and employment security agreements. The main reason behind such practices is that organisations, practitioners, and experts have realised that workplace happiness has an important role in determining the performance and success of the organisation. Workplace happiness can ensure motivation among employees, which can, in turn, further promote the necessary skills and ability to perform their jobs effectively.

Being happy holds significant importance to many people. More importantly, most of the societies around the world, value happiness to a great extent-it causes it to become the basis of the human emotional framework. Fisher (2010) reported that feeling happy is a fundamental experience for human beings and people must remain happy to be emotionally and psychologically well. Fisher (2010) defined happiness as a person's satisfaction with their relationships, work, leisure, and health. It also defined as the set of positive feelings which arise due to the positive experiences in life (Ashkanasy & Dorris, 2017). Based on this definition of happiness, the same feeling at the workplace can be viewed to have constructed of job satisfaction and motivation level of an employee (Fisher, 2010). According to Fisher (2010), there are a large number of happiness-related constructs which affect the creativity and performance of an organisation. These include job solicitation, a typical mood at work, dispositional effect, job involvement, and personal career development. Oswald et al. (2015) present evidence from their findings to support the hypothesis that happiness at workplace is positively related with the performance of an organization and employee performance (Oswald et al., 2015).

There are several factors which can affect the happiness, performance, and creativity of personnel in an organisation. Career development, workload, organisational culture, salary, monetary incentives, and infrastructure, are some of the most important indicators of workplace happiness (Mazuki et al., 2017).

Career development is one of the functions of HRM of any organisation. It focuses on issues such as upward mobility of employees and promotions in the hierarchy of an

organisation. According to Mazurka et al. (2017), the major concern of career development is to ensure that personnel performance increased over the period. In addition to this, career development also aims to promote the overall growth of employees and their skill acquisition. Organisations that promote career development opportunities for their employees have better workplace happiness than the organisations that do not have any programs for career development. The workload is also an important factor which affects the workplace happiness of organisations. Organisations, where people have an adequate workload, have better culture. More importantly, employees' satisfaction with their jobs needs to ensure before the personnel can perform at their maximum potential (Liu et al., 2016).

Better infrastructure has also been found to be associated with better workplace happiness. Several large organisations have worked to create new designs of office buildings, equipment, and facilities which lead to better creativity, happiness, and performance among employees (Mazuki et al., 2017). The ultimate goal of such efforts is to maximise the creativity and performance of employees by promoting workplace happiness (Chandrasekar, 2011).

The culture of an organisation is also important to consider when it comes down to workplace happiness. For instance, the work ecosystem or organisational culture refers to the relationships and values inside an organisation or workplace (Mazuki et al., 2017). Better interpersonal relationships at workplaces are associated with better happiness at work. It has been often found to lead to better performance and creativity among employees as open communication is promoted (Sageer et al., 2012).

Monetary incentives and raises in salaries are also an important factor which determines workplace happiness. A reasonable and high salary can ensure that employees feel more connected to their workplace (Mazuki et al., 2017). Further, it has been found that employees, receiving high salaries, are more productive and creative because they feel motivated. In addition to this, prizes and incentives can also promote workplace happiness and performance among employees.

Leadership style at the workplace is also important in determining the performance and creativity of employees. Yang (2014) reported that leadership style shapes the culture of an organisation, which further influences the workplace happiness. Ethical leadership found to associated with a better focus on the well-being of employees. Any culture which gives adequate attention to the well-being of employees is more likely to have a better index of workplace happiness since the employees feel a sense of connection with their workplace (Yang, 2014). An adequate leadership style in an organisation can ensure that proper team-building skills promoted among the employees. It has a positive influence on workplace happiness, which further positively affects the performance and creativity of employees. Overall, the performance of the organisation begins to rise (Ashkanasy & Dorris, 2017).

Since workplace happiness connected with the level of satisfaction that a person has about their work environment, leadership and organisational culture directly tied to their performance and creativity (Joo & Lee, 2017). Even more important is the fact that the creativity and performance of employees are factors which govern the

performance of an organisation. Happy employees are highly engaged in their work which heightens their performance as well as creativity (Chandrasekar, 2011).

Several research studies have found various methods which can be implemented at workplaces to maximise the potential of the workforce. For instance, goal-setting is a process which can be enforced at the workplace, so the meaning given to the work that an employee does. In this way, the employee is assigned a supervisor and becomes a part of the management processing maximises their job satisfaction since performance measures (Chandrasekar, 2011). Similar to the goal-setting, performance feedback can be enforced at workplaces so that the upper management and leadership know the problems and issues of the employees.

Additionally, the employees feel a sense of belonging to their organisation when the management takes relevant steps regarding their problems (Chandrasekar, 2011). Furthermore; the culture of an organisation can have a significant impact on how employees interact with each other and with the top management. Therefore, it can be said that that leadership style and management of an organisation could determine the workplace happiness of an organisation. This level of happiness, further, determines the performance and level of creativity among employees. In the long run, all of this process affects the performance of an organisation.

Large companies have been becoming more and more concerned about their employees' happiness and well-being. Proto (2016) has found that the workplace environment can be very unhealthy and unsafe for workers in several industries. Unsafe unhealthy, the workplace environment causes the workers to become unhappy regarding their jobs if the problems not dealt with, accordingly (Proto, 2016). It has also found that the majority of offices and workplaces have unsuitable furniture, excessive noise, poorly designed workstations, lack of proper ventilation, and lack of security agreements for employees.

In addition to this, there are many other factors which can affect the workplace happiness among employees, such as an increase in pays or wages, growth in career, and personal development opportunities (Chandrasekar, 2011). In several organisations, the problems mentioned above not adequately addressed which renders the employees unhappy. With the employees growing unhappy, the performance and motivation level drops considerably, as has been noted by Proto (2016). It becomes highly challenging for organisations to keep up their performance or to improve their performance. The overall effect of such problem results in lower performance and creativity among employees. The performance of any organisation is related to the performance and creativity of employees (Proto, 2016).

It has further noted that industry giants such as Google have better performance because their employees are happier than other organisations (Han, 2015). Therefore, the happiness of employees becomes a major problem to be dealt with. Only by promoting happiness at the workplace can an organisation provide the right environment for performance and creativity among employees. Proto (2016) had also found that psychological well-being was of primary concern when happiness at the workplace discussed. For instance, it has found that the motivation level of an employee is directly related to their psychological well-being at their workplace (Han, 2015).

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In any organisation, the performance of employees is reliant on workplace happiness. It is defined as the level of satisfaction that the workers have, regarding their work environment (Mazuki et al., 2017). In addition to this, a happy workforce has more motivation to get a job done as compared to the unhappy staff. Therefore, Mazurka et al. (2017) found that unhappy staffs are usually unable to execute their operations productively as compared to a happy workforce. To maintain sustainability performance offices and workplaces, organisations need to maintain long-term happiness for their employees, as well. Happiness is another factor, in terms of which, the performance of an organisation can be measured, apart from monetary units (Chandrasekar, 2011). Therefore, this study will attempt to investigate the antecedents and consequences/outcomes of workplace happiness.

3 Research Purpose

As has been mentioned before, workplace happiness is something that needs to be addressed in all organisations to ensure performance and success. The concept, at present, is relatively newer than other concepts of management and HRM (Mazuki et al., 2017). Therefore, the specialists of the subjects are adding knowledge to the literature, regarding happiness at work. This concept has to deal with the psychological aspects of human nature, the leadership style of the organisation, the culture of an organisation and the policies of an organisation. Therefore, workplace happiness is a vast topic to discuss (Oswald et al., 2015). The emotional dimension is one of the most important aspects of workplace happiness. By studying the workplace happiness, the various factors can be uncovered which are into play when the performance of an organisation is to be determined.

More importantly, the impact of workplace happiness on employee performance and employee creativity can also be found out. The major reason to study employee performance and creativity is that both of these are key determinants of organisations performances. Unless the performance and creativity among employees of an organisation maximised, it is not possible to achieve the desired results or aims of an organisation. It is also important to mention here that the research study will aid in revealing the role of leadership in promoting happiness at workplace Yang (2014), noted that ethical leadership at workplaces could help in maximising the performance of workers by promoting workplace happiness. Not only workplace happiness is beneficial for the organisations in achieving the organisational goals, but the employees exposed to career development and skills acquisition opportunities (Yang, 2014).

The overall effect of such culture is that the employees have a greater sense of motivation and feel happier about working in their workplace. Enables the employees to learn a wider range of skills and helps them in improving their career. As for the organisation, the benefit is simple and straight-forward, as mentioned before—growth in performance and performance (Chandrasekar, 2011). This importance of workplace

happiness makes it a very valuable concept to be studied and investigated. Furthermore, it becomes important to explore the various underlying factors which can either promote or demote happiness among employees, at the workplace. By understanding the reasons and factors affecting workplace happiness, the performance and creativity of employees can improve.

4 Research Questions

The objective of this study is to examine the main antecedents of work happiness and how the later may impact employees' performance and creativity in context.

RQ1: What are the main determinants of workplace happiness?
RQ2: What is the impact of workplace happiness on employees' performance?
RQ3: What is the effect of employees' performance on employees' creativity?
RQ4: What are the main research methods and research outcomes addressed in the collected studies?
RQ5: What is the main effect of payment criteria in employee happiness?
RQ6: What is the effect of leadership style in employee happiness and creativity?
RQ7: What are the results of employees' performance in creativity?
RQ8: what is the effect of opportunity of learning and personal development in happiness and creativity?

5 Research Hypotheses

Based on our literature review, we propose to test the following:

H1: Leadership style influences positively employees' workplace happiness.
H2: Work environment influences positively employees' workplace happiness.
H3: Flexible pay influences positively employees' workplace happiness.
H4: Opportunities for learning and personal development influences positively employees' workplace happiness.
H5: Employees' workplace happiness influences positively employees' performance.
H6: Employees' workplace happiness influences positively employees' level of creativity.

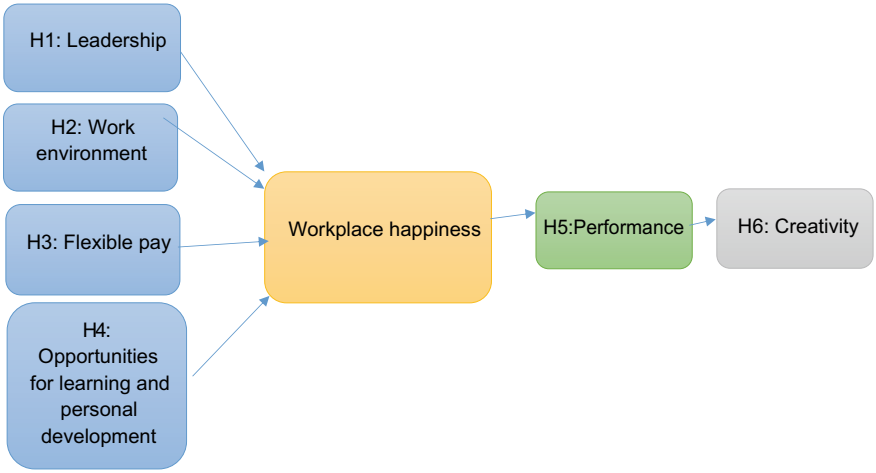

Fig. 1 The study model

6 The Study Proposed Model

See Fig. 1.

7 The Study Terms Definitions

In the following, we define the variables included in the conceptual model.

V1: Workplace Happiness

Workplace happiness is how satisfied and excited the employees feel about their workplace and job. It can make sure that motivation among employees promoted, which can, in turn, further increase the necessary skills and ability to perform their jobs effectively. It has also been found to be associated with the level of satisfaction that a person has about their work environment.

V2: Employee Performance

Employee performance refers to the efficiency and efficacy of a worker to carry out the job or task assigned to them (Bratnicka, 2015). This variable enables an organisation to assess their workers' output in terms of the task they did and the time duration they took to complete it.

V3: Employee Creativity

Employee creativity refers to the attempts of employees to try out something new (Cole, 2015). It helps the employees to think out of the box and enables the organisations to get a competitive advantage over their rivals and competitors.

V4: Leadership Style

Leadership styles can influence organisational culture and workplace happiness. There are several leadership styles, out of which, ethical leadership has been found by Yang (2014) to be associated with a better focus on the well-being of employees. This kind of behaviour in the workplace promotes workplace happiness. Any culture which gives adequate attention to the well-being of employees is more likely to have a better index of workplace happiness since the employees feel a sense of connection with their workplace (Yang, 2014). An adequate leadership style in an organisation can ensure that proper team-building skills promoted among the employees. It has a positive influence on workplace happiness, which further positively affects the performance and creativity of employees. Overall, the performance of the organisation begins to rise if the leadership resonates with the expectations of employees.

V5: Work Environment

Work environment refers to the surroundings of employees while at work. It has a direct influence on employees' performance and their involvement with work (Chancellor, 2015).

V6: Flexible Pay

Pay and financial benefits are important factors when it comes to employee performance and creativity. Employees who receive better pay and benefits are more motivated to work effectively (Davis, 2015).

V7: Opportunities for learning and personal development

Opportunities for learning and personal development refer to special training workshops and sessions that focus on improving the skills and performance of employees. Through such opportunities, an organization can help handle change and promote productivity (Bratnicka, 2015).

8 Literature Review

It is a general concept that happy employees tend to be productive employees. The happiness of the employees at their workplace exerts not only a positive influence on the professional but also the personal lives of the employees. The happiness of the employees at the workplace depends on several factors like the environment of the workplace, leadership at the workplace, availability of the career development

opportunities, characteristics and nature of the job and the compatibility of the person with the environment of the workplace (Joo, 2016).

8.1 Workplace Happiness

Boehm and Lyubomirsky (2008) preliminarily define a happy person as someone who frequently experiences positive emotions like joy, satisfaction, contentment, enthusiasm and interest. Fisher (2010) suggested that happiness can be explained in several ways. Happiness constitutes the pleasant feelings and sensations. Extensive research work has done on the antecedents of happiness at the workplace and the consequences of happiness at the workplace. The definition of happiness at the workplace extends far beyond the mere job- satisfaction. In the modern age of technology and business, there is high competition and rivalry in the business environment. Every industry is, at the moment, facing a large number of rivals. The current situation of competition has made it impossible for the organisations to afford to waste any useful potential of their human resources and workforce. Therefore, the need for maximising performance and creativity arises. Several factors come together to determine the workplace environment suitability for employees. All of these factors can have significant on the performance of any organisation.

Many organisations, nowadays, are promoting new policies for employees which address issues such as health, fitness, work-life balance, lifestyle changes, and other benefits so that the employees perceive their work environment as favourable. All of these efforts are to promote happiness among the workforce.

Based on the above discussion, this research study will attempt to map the patterns of happiness in various organisations across the world. Also, it will try to observe the case of the UAE, so that it can determine the behaviour of employees and their happiness, at their workplaces. More importantly, the study will observe the impact of happiness on employee performance and employee creativity. Research on employee happiness, at present, is quite limited. Therefore, the paper will attempt to bring together knowledge, based on primary sources, to give a valuable contribution to this area.

In most of the societies, the happiness is thought to be the most valued goal of the individuals, groups and organisations. It is the basic human emotion expressed in the form of joy. For the human experience, happiness is the fundamental need, and most of the people are mildly happy at most of the times in their lives (Cole, 2015).

Happiness in the workplace has attracted the attention of several researchers. Over the last past years, several constructs are overlapping the concept of happiness. An important construct of workplace happiness is job satisfaction. The happiness at the workplace related constructs influences the organisational research in many ways like the level of the constructs, duration and stability of a certain construct over time and the content of each construct. The happiness related constructs are usually measured and defined at the personal level like the job satisfaction, mood at work and effective commitment of the employee (Sharifzadeh, 2014).

Its concluded that happiness is the experience of the frequent positive feeling, infrequent negative feeling and the sense of satisfaction with life. To win satisfaction customers, the organisation needs enthusiastic employees who are capable of transferring the loyalty and enthusiasm to the customers, since the success of a business relies upon the satisfaction of the customers.

Work is a significant aspect of the lives of people. Work was done in exchange to intrinsic and extrinsic rewards. The nature and the consequences of work have been changing rapidly over the past few years. The changing environment of the organisations and work like the development of new technological products, the rapidly increasing globalisation and the employment of new organisational practices led to the changing nature of the work (Wesarat, 2015).

Certain practices and strategies adopted by the organisations tend to reduce the happiness and satisfaction of the employees like corporate restructuring and downsizing. Unhappy and unsatisfied employees feel less valued and perceive low job security. The organisations expect performance from their employees and employ managerial tools and techniques to enhance employee performance. By maintaining a higher level of employee happiness and satisfaction, organisations can achieve higher levels of employee performance.

Rego (2008) also suggested that happy employees are productive employees. There is a strong correlation between employee happiness and job satisfaction. In addition to this, job satisfaction and life satisfaction are also influenced by each other. The happiness at the workplace refers to the happiness of an individual at the workplace and life (Rego, 2008).

The significance of workplace happiness is important to understand because the performance of the organisations heavily relies on the happiness and satisfaction of the employees. Happy employees tend to add value towards the organisational goals and set them at their priority as compared to their counterparts who merely work for the earning and do not enjoy the content of their job.

8.2 Employee Performance

The performance of the employees can be perceived as a driver to the organisational performance. The employees who deliver help the organisation move a step forward towards the attainment of its goals and objectives.

Hanaysha (2016) found that one of the most important objectives of a business organisation is to enhance the level of the performance of the employees. The enhanced performance of the employees entitles an organisation and its employees with a wide range of advantages. Higher rate of performance of the employees leads to a higher rate of economic growth, the higher rate of profitability and faster progress of the society. The employees who are more productive and perform well in an organisation get higher wages, benefits, salary packages, better working conditions and other favourable employment opportunities. Better performance of the employees enhances the degree of output and reduces the costs associated with production

and operations thus tending to help the organisation gain a competitive advantage. Employee performance is essential to gain long term success of the organisation (Hanaysha, 2016).

Previous researchers have found that the companies must seek to invest in employee engagement to gain higher levels of employee performance. There exists a positive relationship between employee engagement and performance. The engaged employees are more involved in the work and tend to be more productive. They are more focused than disengaged employees. The engaged employees work more efficiently since they place the organisational success and goal achievement on the priority position in their minds. Employee engagement drives the performance of the employees and results in higher levels of organisational outcomes (Pradhan, 2016).

As highlighted by Pradhan (2016), nowadays, enhancing the level of employee performance are of major concern to every together business organisation. It can be defined as the measure of the efficiency of an employee or a group of employees. Performance, as defined in the objective terms, is the effort or the measures taken that enhance the profitability of the organisation. Performance can be gauged in terms of the output delivered by an employee over a specific period. The performance of an employee can be measured relative to the average work performed by the other employees doing a similar task. In addition to this, the performance of the employees can also be measured in terms of the units produced or managed by an employee in the defined period. The success of an organisation is defined by the level of the performance of the employees, thus making it an important objective for the businesses (Pradhan, 2017).

The performance of the employees can be assessed in several ways. However, there is a need for the development of some standardised criteria to measure the performance of the employees. Employee performance defined as the amount of the time that an employee spends on the job while being physically and mentally present and working efficiently. Time can effectively be as a measure of employee performance. The time that an employee spends at the job or while doing the task that he or she was hired to perform help in evaluating the performance of the employees (Muda, 2014).

The study of the past researches regarding employee performance is related to our study because the more productive the employees of an organisation would be, the more the company would have to deliver to its customers. Attaining customer satisfaction and loyalty is the ultimate goal of every business which can only be achieved when the employees are productive.

8.3 Employee Creativity

Creativity defined by several researchers in different ways. Some researchers defined it as a personal characteristic, and some define creativity as a process. The researchers suggest that a creative proposition can be a product, service or idea if it fulfils the following conditions: it must be original and made for the very first time and it must

be relevant to one's job or beneficial for the organisation towards the attainment of its goals. The researchers also determined the basic personality traits that are associated with the degree of creativity one can depict (Mubarak, 2018).

Hassan (2013) addressed the role of the personal attributes in determining the level of creativity of an employee. Unsworth's matrix of creativity that consists of four types of creativities that vary based on two dimensions I the driver of employee engagement that can be an internal or external stimulus and the problem that the employee is confronting that can be open or close. When the driver of the engagement it external, the employee is engaged to be creative by some external driver of stimulus, and when there is some internal engagement, the employee urges to be creative rather than being forced by some other or external stimulus. The open idea is those ideas that come from the individual employees, and the closed ideas are those that presented to the individuals.

The four types of creativity include the responsive creativity that arises to respond to the problems arising due to the external drivers, the expected creativity that helps in discovering the problems due to external drivers, contributory creativity responds to the problems arising from the internal drivers' proactive creativity that discovers the problems that arise due to the internal drivers. The creativity of the employees is enhanced by the personal as well as by the contextual factors. The contextual factors include the goals and expectations for the pursuance of the creative activities, social influence on the creativity of an individual, relationship with the employer, co-workers and the organisational work setting.

As found by Qureshi (2016), an employee who comes up with new and innovative ideas or suggestions is thought to be creative employee. A creative employee proposes the new ideas for the products or the services to be constructed, influences the communication and the perception which ultimately affects the way done during his or her labour hours. Creativity is the design in which the employee brings an innovation that seeks to resolve the work related problems following the step by step procedure. It can also be explained as the ability of the individuals to develop resourceful solutions to meet the challenges that the employees face while being at a job working individually and in groups.

The creative employee is aware of the organisation and the workplace setting. He or she can be flexible and sensitive to the problems and come up with innovative solutions. The creative employee tends to have a strong memory and remembers the task for a longer period. The creative employee is adaptive and easily copes up with the changing environment and readily accepts technological advancements. Thus, an individual who accepts all the changes or advancements like the change in the organisational culture of the technological changes which are essential to keep pace with the competition termed as a creative employee (Shahzadi, 2014).

The large organisations are more likely to have creative employees. In the current era, the employees constantly exposed to the challenging environment where it is essential to learn and adapt quickly to keep up with the pace of the competition. To achieve the goals promptly, the employees need to be creative. Creativity can also explain as the process of introducing new techniques by individuals and groups to achieve the goals efficiently. The firms that want to compete in the market hire creative

and extrovert employees. The creative employees are expected to bring positive and constructive change in the organisation. The creative employees are flexible and adapt to the technological advancements and cope up with the changes in the external environment of the business. The creative employee has strong interpersonal and analytical skills that enable him or her to devise the ways to resolve the business processes on time (Dul, 2010).

The studies conducted by Nawaz (2018) suggested that empowered employees tend to be more creative since they have a say in the matters of the organisation. Creativity may depend on the employee or the situation that the employee is subject to. The employee may put in all his or her efforts and capabilities to get the best outcome and develop resourceful and creative solutions (Nawaz, 2018).

The past researches suggest that creativity among the employees help the organisations find an efficient means of resolving the work and operational issues. The creative employees not only help the companies find resourceful solutions for the problems but also assist in enhancing the efficiency of the processes.

Fisher, Happiness at Work (2010) Found that happiness mediates the relationship between authentic leadership and employee creativity.

8.4 Antecedents of Employee Happiness

This section will discuss the factors that influence the degree of the happiness of the employees at the workplace. According to Herzberg's Theory of Employee motivations, the factors that influence the job satisfaction of an employee can categorise as the hygiene factors and the motivational factors. The motivational factors are those factors that are concerned with the content of the job and the factors like recognition, acknowledgement, growth opportunities, career advancement, responsibilities and the tasks assigned to him or her. On the other hand, the hygiene factors are the factors that are not related to the content of the job the employee is performing like the salary, job security, workplace settings, company policies and strategies and the interpersonal links at the workplace. As explained by Herzberg's Theory, the motivational factors being employee happiness and satisfaction while the absence of the hygiene factors brings dissatisfaction of the employees. The extrinsic factors are the events that arise from the efforts of the employees as well as the other factors that are not directly involved with the job of the employee. The compensation, benefits, interpersonal ties with the colleagues and the workplace setting influence the outcomes of the employees but they are not a fundamental part of the job of the employee (Pauceanu, 2016).

8.5 *The Extrinsic Factors of an Employee's Happiness at the Workplace*

The factors affecting the happiness of the employees at the workplace can categorise as the extrinsic and intrinsic factors (Shu Zhou, 2013). The extrinsic factors of an employee's happiness at the workplace are.

8.5.1 Workplace Environment

The level of the employees' happiness and their satisfaction gauged by the environment of the work placement. Since the employees spend the major part of their day at the workplace, so it is very important for the organisation to ensure the availability of a clean and suitable workplace for them. Proper working conditions promoting a professional culture must provide to the employees. Proper working conditions will promote the performance of the employees, and they will work in a relaxed manner, thus feeling happier with the workplace (Štreimikienė, 2009).

The organisation must ensure to provide all the necessary resources to the employee that are necessary to perform the particular task or the job that he assigned. If the work conditions are not appropriate, the employees might lose their interest in their work and will not enjoy it. The dimensions that constitute the work environment satisfaction are: the natural environment of the workplace like humidity, noise, brightness, cold, smell and other natural environmental factors, the second dimension of the workplace conditions is the availability of the required tools and equipment. Are the tools and equipment necessary to perform a job readily available to the employee?

The third dimensions are the working timings and hours and the overtime hours. The fourth factor is the safety of the workplace. Are the health and safety legislation properly being followed and the employees are safe?

8.5.2 Compensation

The pay and compensation include whatever the employee paid against the tasks that he performs while being at the job. Pay defined by the researchers in several ways like the basic salary and the other fringe benefits like the housing rent, medical allowance, transport allowance and the overtime salary. Pay or compensation includes the financial as well as the non-financial awards that the employee gets against his services for the organisation. If the organisation hinders the pay of the employees, their happiness and satisfaction levels will greatly decline. When the employees are compensated rightly and justifiably for the task that they are performing, and they can easily manage the workload assigned to them, they will feel happy with the job. Salary is one of the hygiene factors described by Herzberg's Theory, and it greatly accounts for the employee's happiness and satisfaction at the workplace. The

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compensation plan of the organisation greatly influences the level of the happiness of employees at the workplace. The better the compensation the company offers, the more satisfied and happier the employees would be. Compensation and benefits are very important factors influencing employee happiness in the workplace.

8.5.3 Organisational Commitment

The strongly committed the employees are to the organisation, the higher will be their loyalty and dependence with the organisation. When the employees are committed to the organisation, they have a stronger sense of ownership and thus feel happier.

8.5.4 Self-realisation

The self-realisation comes at the top of Maslow's Hierarchy of needs and is an important determinant of the employee happiness at the workplace. The feeling of self-fulfilment had a strong influence on the level of employee happiness.

8.5.5 Health Concerns

The organisations focus on employee health and well-being. The organisations invest in employee health maintenance programs and policies. The organisations that impart significance to the employee well-being and health tend to have satisfied and happier employees.

8.5.6 Nature of the Job

In addition to the hygiene factors, the motivational factor that is the nature of the job also greatly influences the happiness of the employees at the workplace. Different aspects of the job like the salaries of the growth opportunities and terms with the supervisors. Influence the happiness level of the employees. When employees perceive that they are performing a productive task, they feel happier and more satisfied. The challenges associated with the tasks that are worthwhile in an organisation, drive the motivation and confidence of the employees and they develop an interest in their work, thus feeling happier with the workplace.

8.6 The Intrinsic Factors Influencing the Level of Employee Happiness at the Workplace

The intrinsic factors influencing the level of employee happiness at the workplace are.

8.6.1 Degree of Autonomy Imparted to the Employee

The employees want to feel empowered in the organisation where they work. The employees need the authority to perform the tasks assigned to them properly. There is a positive relationship between employee happiness and autonomy in the workplace. When the employees empowered in their jobs, they take pride in the work that they do.

8.6.2 Recognition

Recognition can be defined as the situation in which the organisation acknowledges the efforts of the employees and appreciate them by rewarding them some status in the organisation. Among the recognition of the intrinsic and non-financial reward is the most important one. It makes the employees feel valued and appreciated, and they fee motivated thus doing all the tasks with more interest and focus. The organisation can gain a competitive advantage by awarding employees with recognition. When the employees rewarded for their efforts, they become more loyal and happier with the organisation and go the extra mile for the attainment of the organisational goals and objectives.

8.6.3 Meaningful Work

The meaningful work is a very important factor shaping up the perceived happiness of the employees. The employees want to be engaged in productive tasks and qualitative work. Meaningful work is very crucial for the success of the organisation as well as the employee. Apart from money, there are some factors that an employee wishes to share with the community and his circle. Sense of achievement and responsibility are among the most important such factors. The employees who are engaged in meaningful work feel happier and more satisfied because they perceive themselves responsible.

A large number of factors act as the antecedents of employee happiness and well-being. The wages and compensation do not always motivate the employees, but some hygienic factors as well that include the organisational work setting.

In this study, we decide to focus only on the work environment, leadership style and compensation as antecedents of workplace happiness.

8.7 Role of Workplace Happiness

The author says that it is necessary for an organization to understand what the employees feel and what they want. In this way, the organization can shape up its policies and strategies and can devise the ways to enhance the loyalty of the employees. Enhancing the happiness and satisfaction of the employees is crucial for the efficient performance of the organization (Malaolu, 2013).

Workplace happiness means how often the employee feels joy in relation to his or her job. The feelings of happiness are constructive and positive. There is a positive relation between employee happiness at the workplace and the organizational performance. The workplace happiness provides input for the better performance of the organization. Workplace happiness creates positive feelings among the employees regarding their jobs, and they tend to perform better resulting in greater outcomes for the organization.

The outputs are the obvious features of the performance of an organization. Most of the organizations measure their performance in relation to the degree to which they are achieving their mission. The organizations that are moving towards the attainment of their mission are said to be performing well. When the employees are happy and satisfied, they serve the customers of the organization as per plan and thus helps the organization increase the cash inflows (Nur, 2015).

9. Organizations can dramatically be changed by leveraging creativity and innovation. Creativity is the starting point of bringing innovation in an organization. The creativity is contagion across the organization. The individual creativity has an effect on the creativity of the group. The creativity of the group has an effect on the creativity of the organization and the creativity of the organization ultimately drives the innovation across the entire organization (Han, 2015). The creativity of the employees helps

9 Data Collection and Analysis

9.1 Keyword Search

The researcher has been used some key words in order to find similar factors, see the Table 1.

9.2 Journal Databases

The researcher has been found many results in the databases that has been used, Table 2.

Refer to search scores, the researcher found that 307 studies were gotten based on the search terms that are explained in Table 2 and Fig. 2. While presenting data analysis, the researcher removed some studies such as low-quality studies, and 27

Table 1 Keyword search

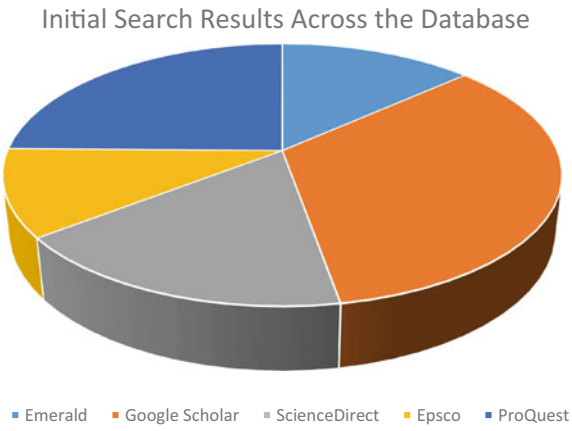
Keyword search
"Workplace" and "Happiness" and "Employee" and "Performance"
"Happiness" and "Work placement"
"Workplace happiness" and "Creativity" and "Performance"
"Happiness" and "Performance" and "Innovation"
"Happiness" and "Employee" systematic review
"Workplace happiness" and "Employees"
"Workplace happiness" and "Employees" and "Systematic review"

Table 2 Initial search results across the database

Journal databases	Frequency
Emerald	41
Google scholar	104
ScienceDirect	53
Epsco	33
ProQuest	76
Total	307

duplicate results were excluded. The researcher also removed 231 articles from the remaining after screening inclusion and exclusion. Furthermore, qualitative studies that did not give specific information that help us in finding needed information were removed.

Fig. 2 Initial search results across the database



9.3 *Flowchart for the Selected Studies*

The researcher has been searching in five databases to find the external factors frequently used and joined the results together by using below criteria in order to give the connection between the papers Table 3. In around 80 studies there was more than 210 external factors were identified, but we chose only six external factors that have a relationship which described in Table 3 such as (Work Placement Happiness, leadership, Payment Methods, Work Environment, Creativity and Performance) (Figs. 3, 4 and 5).

Table 3 The most commonly used external factors across databases

External factors	Database					
	emerald	Google scholar	ProQuest	ScienceDirect	Epsco	Total
Work placement Happiness	5	7	9	4	2	27
Leadership style	4	5	0	10	3	22
Flexible pay	5	8	8	11	9	41
Work environment	3	8	9	2	7	29
Creativity	4	5	1	6	0	16
Performance	3	0	6	1	8	18

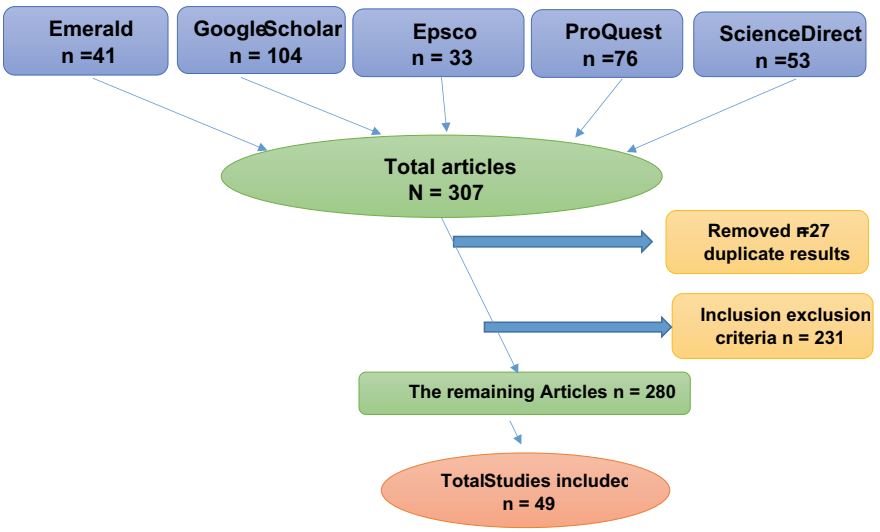


Fig. 3 Flowchart for the selected studies

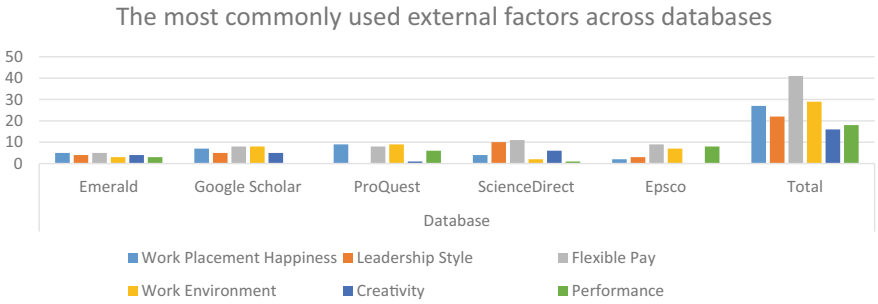


Fig. 4 The most commonly used external factors across databases

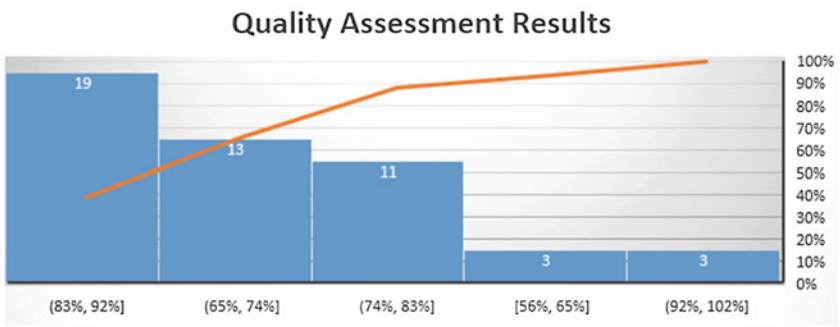


Fig. 5 Quality assessment results

9.4 Inclusion Criteria

There are specific inclusion/exclusion criteria for the systematic review such as specific data for the articles, type, design, context, outcomes, measurement as well as language which are as follows (Table 4).

9.5 Quality Assessment Checklist

See Table 5.

9.6 Quality Assessment Results

See Table 6.

Table 4 Inclusion and exclusion criteria for customer retention studies

Inclusion criteria	Exclusion criteria
– Context: should be in workplace happiness impact – Measurement: articles in which the impact of the workplace happiness on the employee performance and level of creativity – Language of articles should be In English – Date: Published in the period 2010 to 2020 – Type of Studies: Qualitative, Peer-reviewed, empirical studies – Outcome: employee performance and creativity – Study design: systematic, randomized and meta-analysis – Could include articles, reports, or theses	– Knowledge management process or factors that are used in context other than impact of workplace happiness – Information in knowledge management which not related and not support to Workplace happiness and impact on employee – Articles in not English Language

Table 5 Quality assessment checklist

Numbers	Questions
1.	Are the research aims clearly specified?
2.	Was the study designed to achieve these aims?
3.	Are the variables considered by the study clearly specified?
4.	Is the study context/discipline clearly specified?
5.	Are the data collection methods adequately detailed?
6.	Does the study explain the reliability/validity of the measures?
7.	Are the statistical techniques used to analyze the data adequately described?
8.	Do the results add to the literature?
9.	Does the study add to your knowledge or understanding?

Table 6 Quality assessment results

Study	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Total	Percentage (%)
1	1	1	0.5	1	1	1	0.5	0.5	1	7.5	83
2	1	1	1	1	1	1	1	1	1	9	100
3	1	1	1	1	0.5	0.5	1	1	1	8	89
4	1	1	0.5	0.5	1	1	0.5	1	1	7.5	83
5	1	0.5	1	1	1	1	1	0.5	1	8	89
6	1	1	1	0.5	0.5	0.5	1	1	0.5	7	78
7	0.5	0.5	1	1	0.5	1	0.5	0.5	0.5	6	67
8	1	0.5	0.5	1	1	1	0.5	1	1	7.5	83
9	1	1	1	0.5	0.5	1	0.5	0.5	1	7	78
10	0.5	0.5	0.5	0.5	1	1	0.5	1	0.5	6	67
11	1	1	1	0.5	0.5	0.5	0.5	0.5	1	6.5	72

(continued)

Table 6 (continued)

Study	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Total	Percentage (%)
12	1	1	1	0.5	1	1	1	0.5	1	8	89
13	1	0.5	0.5	0.5	1	1	1	1	1	7.5	83
14	0	0.5	1	0.5	1	0.5	0.5	1	0.5	5.5	61
15	1	1	0.5	1	0.5	0.5	0.5	1	0.5	6.5	72
16	0.5	0.5	1	1	1	0.5	0.5	1	1	7	78
17	1	0.5	1	0.5	1	0.5	1	0.5	0.5	6.5	72
18	0.5	1	1	0.5	0.5	0.5	0.5	0.5	0.5	5.5	61
19	1	0.5	1	1	1	0.5	0.5	0.5	1	7	78
20	1	1	0.5	1	1	1	0.5	0.5	1	7.5	83
21	1	1	1	1	0.5	1	0.5	1	0.5	7.5	83
22	1	1	1	1	1	0.5	1	0.5	1	8	89
23	1	1	0.5	0.5	0.5	1	0.5	1	1	7	78
24	1	0.5	1	1	0.5	1	1	0.5	1	7.5	83
25	1	1	0.5	0.5	0.5	0.5	1	1	0.5	6.5	72
26	0.5	0.5	0.5	1	0.5	1	1	0.5	0.5	6	67
27	1	0.5	0.5	1	1	1	0.5	1	1	7.5	83
28	1	1	0.5	0.5	1	1	1	0.5	1	7.5	83
29	0.5	0.5	1	1	1	0.5	0.5	1	0.5	6.5	72
30	1	1	1	1	0.5	0.5	1	0.5	1	7.5	83
31	1	1	0.5	0.5	1	0.5	1	0.5	1	7	78
32	1	0.5	0.5	1	1	1	1	0.5	1	7.5	83
33	0	0.5	1	1	1	0.5	0.5	1	0.5	6	67
34	1	1	1	1	0.5	0.5	1	1	0.5	7.5	83
35	0.5	0.5	1	0.5	1	1	0.5	1	1	7	78
36	1	1	1	0.5	1	0.5	1	0.5	1	7.5	83
37	0.5	1	1	0.5	1	0.5	0.5	0.5	0.5	6	67
38	1	0.5	0.5	1	1	0.5	0.5	0.5	1	6.5	72
39	1	1	0.5	0.5	1	1	0.5	0.5	1	7	78
40	1	1	1	1	1	1	1	1	1	9	100
41	1	1	0.5	1	0.5	0.5	1	1	1	7.5	83
42	1	1	0.5	0.5	1	0.5	0.5	1	1	7	78
43	1	0.5	1	1	0.5	1	1	1	1	8	89
44	1	1	1	0.5	0.5	0.5	1	1	0.5	7	78
45	0.5	0.5	1	0.5	0.5	0.5	0.5	0.5	0.5	5	56
46	1	1	1	1	1	1	1	1	1	9	100
47	1	0.5	1	0.5	0.5	1	0.5	0.5	1	6.5	72
48	0.5	0.5	0.5	0.5	1	1	1	1	0.5	6.5	72
49	1	1	1	0.5	0.5	1	0.5	0.5	1	7	78

9.7 Classification of the Study Process and Previous Studies

Author	Year	Study title	Variables	Location & sample size	Findings
NGUYEN NGOC AN	2015	"Actors affecting employee creativity & ITS impact On organizational innovation capability in state Owned banks in Hanoi, Vietnam"	Employee creativity and organizational innovation	Vietnam 24	This study helped us identify the relationship between employee creativity and organizational innovation. We found positive relation between the two variables
Malikeh Beheshtifar and Elaheh Zare	2013	"Employee creativity: a compulsory factor in organizations"	Employee creativity	Iran Secondary research	The results indicated that the organizations can improve creativity by hiring the candidates who are potentially creative and are energetic to support the positive change in organization
Katarzyna Bratnicka	2015	"Creativity and effectiveness in organizations"	A framework was established to show the relationship between the variables—Creativity and effectiveness	Katowice Secondary Research	The study depicted that the organizational creativity not only adds towards the efficiency and effectiveness of the organization, rather it also influences the emergence
Larry E. Cole and Michael S. Cole	2014	"Employee satisfaction and organizational performance"	Employee satisfaction and organizational performance are the variables of this study. The study used secondary data	USA 200	This study concluded that the performance of employees is related to the performance of organization and this finding can be generalized across all the firms and industries
Jan Dul and Canan Ceylan	2014	"Work environments for employee creativity"	Work environment and employee creativity	Netherlands 409	This study investigated the effect of the social, personal and psychological factors on the creativity of the individuals. The conceptual model depicted this relationship

(continued)

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Author	Year	Study title	Variables	Location & sample size	Findings
Jae Hoon Han, Jin Taek Jung and Hyung Kun Joo	2015	"A study on effects of creativity to organizational innovation"	Individual creativity, group creativity and organizational performance	Korea 260	The results reflected that the individual creativity and creativity in groups have no significant impact on the organizational creativity
Mobrezi, H., & Khoshtinat, B	2016	"Improving employee productivity through work engagement: Evidence from higher education sector"	Employee engagement and employee creativity	Malaysia 242	The results indicated that the work engagement positively influences the employee creativity. The study also proved that all the dimensions of work engagement influences the productivity of the employees
Masood UL Hassan, Ahmad Mehmood Malik and Amna Hasnain	2013	"Measuring employee creativity and its impact on organization innovation capability and performance in the Banking Sector of Pakistan"	Employee creativity, organizational performance and organizational innovation	Multan 164	The results showed that the complexity of the job and relationship with the manager directly influence the creativity of the employees. Moreover it showed positive relationship between employee creativity and organizational performance
Baek-Kyoo Joo and Insuk Lee	2016	"Workplace happiness: work engagement, career satisfaction, and subjective well-being"	Workplace happiness and employee well being	Korea 550	The study indicated that the employees who are dedicated to their work and enjoy their jobs tend to have greater level of workplace happiness
Andrew J. Oswald	2009	Happiness and productivity	Happiness—productivity—performance and organization	Bonn 180 male and female	Positive effect on productivity and happiness as this study found happiness in a workplace carries with it a return in productivity

(continued)

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Author	Year	Study title	Variables	Location & sample size	Findings
David Sweetman, Fred Luthans, James and Brett	2010	Relationship between positive psychological capital and creative performance	Positive organizational behavior—organizational—performance creative—employee	Working adults 459 males & 417 females N = 899	The study examine the significant relationship between working adults specific positive psychological resources with their performance in creative exercise. Employee creativity is a widely recognized ingredient of innovation in organizations
Micu Nngela & Necula Ramona	2017	Pursuing happiness in the workplace, purpose and challenge for human resources management	Job—happiness—satisfaction	N = 50 employee	study examine to be truly happy at work we need to contribute to the happiness of others who work with us and who also want their stat of well being-happiness at work cannot be overlooked but consciously assessed if it is to achieve organizational performance and profit
Abdul Ghani Kanesan	2016	Understanding wokplace happiness in schools: the relationship between workplace happiness, teachers' sense of efficacy, affective commitment and innovative behavior	Innovative behavior—self efficacy and trust	Teachers in Malaysia N = 835	This study show that workplace happiness has a relationship with teacher's innovative behavior and examine that, there is a direct Relationship between happiness at work on affective commitment

10 Research Limitations

The research limitations refer to the issues and problems which have been faced during the course of design and analysis. The research has been focused on workplace happiness and how it impacts employee creativity and performances. The overall research has been conducted in terms of primary data analysis. This method has posed different issues within the course of research. These issues include diverse

activities which are related to the data analysis and collection of data as well. The limitations which have been mentioned were tackled on the basis of using ethical guidelines and standards. These were also based on achieving the complete aims and analysis of the research.

11 Conclusion

The research has been compiled on the basis of workplace happiness and its impacts on employee creativity and performance as well. Human Resource Management practices revolve around the factors of implementing change and techniques. The implementation of these changes defines how the organizational structure is also balanced. These services and products also define the company values towards the people and the community. Workplace happiness is something that needs to be addressed in all organizations to ensure performance and success. The focus of this research is to develop different hypotheses about employee's happiness and his performance. Different factors will be tested to see their correlation with employees' happiness, and then this factor of happiness is used to evaluate its effect on employees' performance. It is concluded that leadership style, flexible pay, effective working environment positively affects employees' happiness at the workplace and in turn employees' happiness effects their performance at the organization.

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