

A Mediated–Moderated Model for Innovation Attributes and E-Commerce Adoption of SMEs

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ABSTRACT

Understanding how innovative attributes influence adoption decisions is still a hot topic in the innovation management literature, prompting a call for more research. This study intends to evaluate a constructed conceptual model that depicts the relationship between the three aspects of innovation and E-commerce adoption as mediated by attitude and organizational resource readiness, based on theories of innovation and behavior. The moderating influence of innovativeness in the link between attitude and organizational resource readiness and E-commerce adoption is also investigated in this study. The findings are based on data from 259 Kuwaiti SME owners and managers. The mediation of attitude and organizational resource readiness was investigated using a bootstrapping method based on the PLS-SEM technique. The findings show that attributes of innovation can improve attitude and organizational resource readiness. Furthermore, the relationship between the three independent constructs, namely relative advantages, compatibility, complexity, and E-commerce adoption, is mediated by attitude and organizational resource readiness. Meanwhile, the association between attitudes, organizational resource readiness, and E-commerce adoption is strongly moderated by innovativeness. The findings of this study provided insights into the causal mechanisms behind the relationships between attributes of innovation and E-commerce adoption that could not be acquired using a single theory-driven model.

Keywords: Attributes of innovation, attitude, organizational resource readiness, innovativeness, adoption of E-commerce Kuwait.

1. INTRODUCTION

Advances in information and communication technology (ICT) and its applications, such as E-commerce have changed traditional marketing and they are a good indication of the ability of companies to modernize, compete in globalized environments and become innovative businesses worldwide [1]. Among the opportunities provided to companies, especially small and medium-sized enterprises (SMEs) by arrangement

with automation, access to information, lower transaction costs, development of the production function, and thus increased productivity and efficiency of companies [2-4]. Therefore, managers of SMEs must use ICT tactically within their organizations to take advantage of ICT applications, i.e., E-commerce. However, although the adoption and diffusion of E-commerce have a positive impact, SME managers need to change their attitudes and emphasize the willingness of their organizations to maximize their benefits and influence adoption decisions [5,6].

According to diffusion of innovation (DOI) theory, the attributes (or characteristics) of ICT (innovation), i.e., relative advantage, compatibility, and complexity are assumed as salient determinants to influence the decision maker's attitude and organization resources toward the innovation adoption decisions in organizations [e.g., 7-11]. The results of Vagnani and Volpe [9] and Vagnani et al. [12] meta-analysis of the innovation attributes that affect adoption suggest that three innovation characteristics, relative advantage, perceived compatibility, and complexity influence behavioral preferences of managers and, in turn, adoption decisions in the organization. Their findings also provide a deeper understanding of the theoretical framework and empirical variables that are likely to have an impact on organization adoption decisions. In addition to their analysis of the DOI literature, they identified that results of previous studies regarding attributes of innovation -innovation adoption linkage are highly mixed and need to guide future innovation adoption research. These inconclusive results are due to two factors: First, a decision to adopt is made if the aforementioned characteristics encourage alterations in the mindset of the managers making the decision as well as the establishment of sufficient organizational resources relevant to the process of innovation adoption. Second, a practical reason could be the intervening variables linking have not been taken into account [9, 12].

Among the research needs they expressed are the following: (a) the need for more and better research; (b) consideration of potential mechanisms such as the attitude of decision-makers for understanding and explaining the relationship between innovation attributes and adoption decisions; and (c) including additional moderating variables (e.g., innovativeness) on the attributes of innovation—the mediator—adoption decision chains. Thus, in this context, there is a strong need to understand conditions associated with a conclusive conceptual framework on the attributes of innovation—E-commerce adoption decision linkages. However, as a meta-analysis of the innovative use of secondary data derived from the research published by various authors in several journals over a wide range of years may pose a validity threat [13], one must question whether or not the relationships examined. Most studies are based on a meta-analytic review to develop an integrated model that considers the relationships between innovation attributes and innovation adoption decisions without empirical analysis [9, 12,13]. Herein, we conduct such an examination.

Although literature regarding both DOI [8] and Theory of Planned Behavior (TPB) by Ajzen [14] are often cited together in research articles, few research studies have incorporated different theoretical models to understand the adoption of decision-

making processes such as attributes of innovations-innovation attitude-behavior models. The main intention is to understand the rationale in the decision-making of E-commerce adoption - through these theories; thus, the cognitive method can elucidate the managers' behavior and organizations, and the combination of theories leads to novel insights. According to these theorists, firms that have been able to assess the potential benefits of attributes innovation of E-commerce that bring SMEs and therefore the expected net benefits of innovations according to such assessment they make a greater level of attitude toward the decision to adopt an innovation. Only the mediating role of managers' behavioral preferences (e.g., attitude) and organizational resources, but not organizational resource readiness, is considered in the attributes of the innovation-adoption decision chain in organizations in the previous studies [e.g., 9, 12].

We discuss how attitude and organizational readiness may help transform attributes of innovations into greater adoption of E-commerce. These mediators have been chosen in line with the researchers' argument that attributes of innovation are likely to shape the attitude and organizational readiness capabilities to generate greater E-commerce adoption [9, 12]. Additionally, organizations' readiness resources are taken into account while making adoption decisions, making it a mediating variable [12]. It is assumed that both managers' attitudes and resources would play a mediating role in the characteristics of the innovation-adoption choice relation in businesses [15]. It is consistent with both the information-motivation-behavioral skill model [16] and the innovation-adoption choice model [12] to assume that an organization's readiness resources act as a mediating variable. As a result, more resources are likely to boost the potential value that an organization can derive from a new technology, which will encourage the adoption of the technology [12]. Consequently, the readiness resources of an organization are a crucial mediator to take into account when analyzing how innovations are adopted and linked to attributes of innovations.

Furthermore, the framework of this study captures the moderating effects of innovativeness between mediating variables and E-commerce adoption for SMEs at the organizational level, which is the under-researched context of a transition and emerging economy. Innovativeness is chosen as the moderating factor since it can make the relationship between mediating variables and E-commerce adoption stronger. For instance, if the owners or managers are more innovative, they may be able to positively affect their attitudes and resources to make SMEs more open to adopting E-commerce [5]. In light of this, it was concluded that innovativeness is not the only factor to consider when making an adoption decision but may also be able to moderate the relationship between attitude and innovation adoption [17, 18]. As such, owners and managers who exhibit high levels of innovation frequently believe that e-commerce will help SMEs become more inventive and better utilize organizational resources, which may result in the adoption of e-commerce with success.

To the best of the author's knowledge, no prior empirical works have provided such a combination of innovativeness with the features of innovation—two mediators—and the links with Ecommerce adoption in SMEs. The study specifically aims to respond to

the following research: (a) Do attitude and organizational resource readiness mediate the relationship between attributes of innovation and adoption of E-commerce by SMEs?; and (b) Does the innovativeness moderate the relationship between the attitude, organizational resource readiness, and E-commerce adoption by SMEs?

In the remainder of this article, we briefly review the innovation adoption literature describing the development of a theoretical model on the relationships between innovation attributes and innovation adoption. Then we develop hypotheses, describe our method, and present the results of the analysis. We conclude with a discussion of our findings, implications, and recommendations for future research.

2. THEORETICAL BACKGROUND

2.1 Conceptual framework

The development of a theoretical model is essential for understanding the mechanisms that underlie the relationships between attributes of innovations and adoption decisions. Some research investigations [7, 8, 10, 14] have been conducted to establish a theoretical model, but most of them are outdated. Therefore, there is a need to address more comprehensive frameworks that capture positive (e.g., perceived relative advantages and compatibility of new technology with existing technologies) and negative factors (e.g. complexity simultaneously) that influence innovations and adoption decisions [19]. To date, the literature on technology adoption decision-making mechanisms in E-commerce adoption - innovation attributes links are widely studied in empirical analysis. However, several empirical studies in transitional and emerging markets documented an inconclusive relationship between attributes of innovations such as relative advantage, complexity, compatibility, and the adoption of E-commerce [20-26].

Other research has carried out an important meta-analysis to create a conceptual framework to comprehend the characteristics of innovation-adoption decision interrelationships in organizations are mediated by both the managerial resources and behavioral preferences (e.g., attitude) and moderated by the life cycle of innovation [e.g., 9, 12]. However, the use of secondary data in meta-analysis derived from research published by a variety of authors in several journals over a wide range of years may pose a threat to credibility [13], thus empirical evidence is needed for confirmation of this theoretical framework. Thus, this paper fills the gap by using a multidimensional conceptual framework and examines the attributes of innovations that reshape the managers' attitude and organizational resource readiness to adopt E-commerce among SMEs. This empirical research extends the theoretical framework of various scientific [7, 8-10, 12, 14]. The conducted study not only tests and verifies the current results but also enhances the knowledge base depending on a newly derived model from the works of Vagnani and Volpe [9] and Vagnani et al. [12].

The relationships and interactions were based on the previous theories of DOI and TPB. The two theoretical frameworks are very suitable for deriving factors for adopting E-commerce. This model used the theory of DOI and TPB theories that elucidate the

attributes of innovations, i.e., relative advantage, compatibility, and (complexity) which have been recognized as the most significant and positive (negative) effects factors influencing innovation adoption [6, 9, 27, 28]. The TPB model is very much linked to the attitude of managers as well as organizations' resources towards e-commerce-related technologies by including the antecedents of the attributes of innovations that are associated with favorable or unfavorable attitudes to the behavior, positively or negatively [14]. In this current study, we saw that the inclusion of attributes of innovations explains the TPB model better. In addition, The DOI and TPB have demonstrated the role of managers/owners' innovativeness in their attitude and acceptance of technology which is determined by various characteristics of innovation [5, 29]. Thus, innovativeness emerged as a significant moderator of the TPB model's hypothesized relationships. This study is built on an informed meta-analytical review on the adoption of innovations and employed a mediation–moderation model to understand the mechanisms of the relationship between attitude, organizational resource readiness, and E-commerce adoption. Figure 1 illustrates the study's conceptual framework.

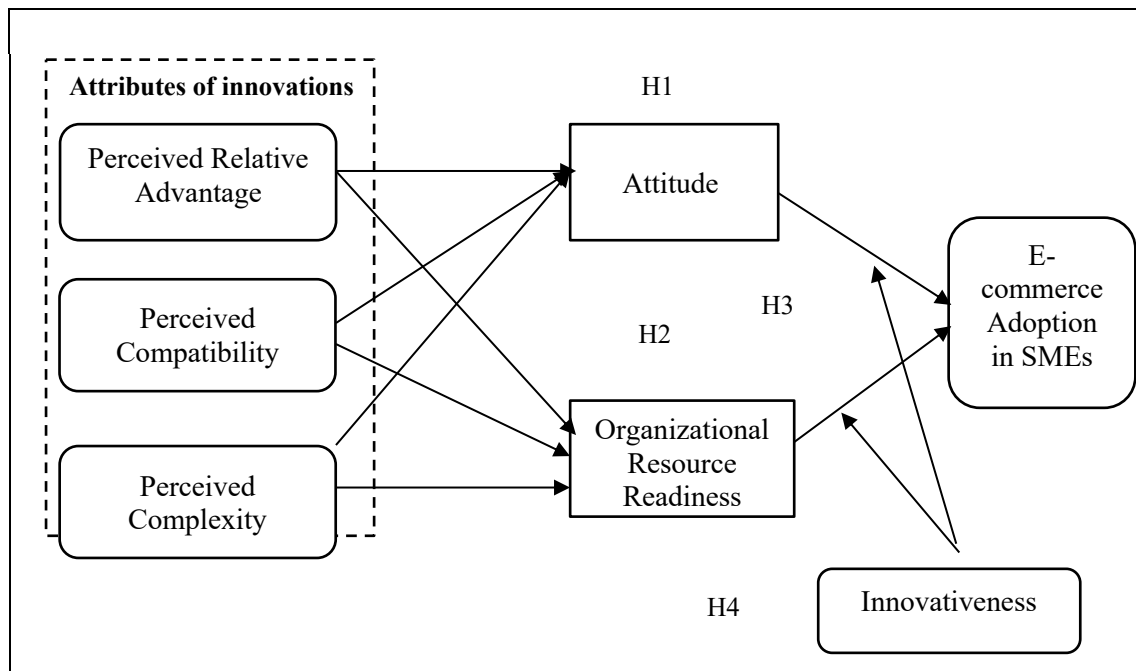


Figure 1. Conceptual framework

2.2 Attitude

Attitude toward E-commerce in this study is conceptualized as the degree to which a decision-maker holds a positive attitude toward the adoption of the innovation [13,30]. Therefore, attitude plays an important part in creating an intention to perform a particular behavior, such as the adoption of innovation [31]. To and Ngai [32] provide insights that managerial attitudes are keys to explaining innovation determinants and adoption links. Specifically, the study outcomes indicate that attitude has a direct and indirect influence on E-commerce adoption. Other studies based on the technology

acceptance model [29] suggested only a subset of the determinants of innovation (i.e., perceived usefulness) are mediated by the attitudes of decision-makers.

Concerning the attributes of innovation and attitude towards the adoption of E-commerce, this paper supposes that the attributes of innovation (i.e., relative advantage, compatibility, and complexity) affect a decision maker's attitude. As the benefits of innovation/e-commerce adoption (e.g., connecting customers, meeting their needs, increasing sales, improving productivity, cost-effectiveness) with compatibility and less complexity, make a positive attitude toward E-commerce adoption backed by several areas of research in DOI and TPB [e.g., 19, 33-35]. Based on these evaluations, the decision-makers tend to develop a positive or non-positive attitude toward the behavior.

Several researchers have attempted to analyze the mediating factors of the link between innovation attributes and E-commerce/innovation adoption in terms of attitude mediation [e.g., 12, 29, 32, 36-38]. Similarly, Wang et al. [39] exhibited that leaders' attitude is a mediating variable in the relationship between technological factors and adoption intention. A recent the previous meta-analysis on the effects of specific attributes of innovations (i.e., relative advantage, compatibility, and complexity) on managerial decisions on the adoption of innovations in organizations was conducted by Vagnani and Volpe [9] suggested that attitude serves as a mediator between these attributes and adoption of innovation. The results of the review called for future studies to consider the mediating mechanism that may explain the attributes of innovation and adopt reverse relationships. Specifically, the study outcomes indicate that attitude has a direct and indirect influence on E-commerce adoption. In this vein, if a new E-commerce technology with positive relative advantages - specifically, in terms of timely providing information for decision-making purposes, managers are more likely to develop a positive attitude toward adopting E-commerce.

Conversely, the unsuitable of the new system of E-commerce with more business procedures negatively affects the managers' attitudes and raises their resistance to change, which in turn impedes the adoption of E-commerce. because the owners/managers believe that its approval can be a source of further costs for the organization, and infrastructure system [40]. As such, due to the negative attitude of decision-makers, an innovation system has less chance of innovation adoption [12]. In turn, the E-commerce system with relative advantages, more compatibility, and less complexity positively affects the attitude of the owner/manager, which in turn leads to the adoption of E-commerce. Accordingly:

H1: A decision maker's attitude will be positively (negatively) influenced by relative advantage and compatibility (complexity) (H1a-Hc), and this attitude will serve as a mediating variable (H1d-H1f), which is expected to positively affect SMEs' adoption of E-commerce.

2.3 The organizational resource readiness

Organizational resource readiness reflects the availability of human resources, financial/business, and technological resources at the disposal of the firm to approach and adopt innovations [23, 27]. Several studies have shown that organizational, financial, and technological resources determine the adoption of E-commerce technologies [6, 23, 41]. The more excess these organizational resources improve the organization's ability to deal with risks and absorb the cost of innovation failure, as well as the organization's willingness to adopt innovative technology [39]. If the technology that the organization adopts will improve the performance of the original technology, the organization will have to adopt the technology more. As the cost of adopting new technologies is reduced and the difficulty of using new technologies is reduced, the organization's resource readiness to adopt new technologies will be enhanced [39]. For SMEs, organizational resource readiness provides opportunities to improve business processes through technology adoption and business growth [23]. If an SME is considering the adoption of E-commerce, it can focus on raising awareness of the potential benefits of these technologies and the compatibility between such technologies and the management of the organization, and thus this will lead to building internal organizational readiness and its adoption of technology [23, 29]. Therefore, based on previous literature, organizational resource readiness is likely to mediate the attribute of innovation–adoption decision linkages in organizations.

The previous literature assessed the DOI and TPB to ascertain the adequacy of resources to support the adoption of the behaviors. Concerning the link between the attribute of innovation and organizational resource readiness, [12] proposes that the innovation attributes relative advantage and compatibility (complexity) should be seen as a determinant of organizational readiness and should be anticipated to be either positively (or extremely negatively) correlated with the organization's resources for the adoption choice. More attributes, such as relative advantage (i.e., perceived usefulness) and perceived ease of use have been identified as enablers for change readiness [7]. These types of innovation determinants are argued to still affect the readiness by the potential benefits that a company could derive from a new technology, which would therefore encourage adoption.

According to Vagnani et al. [12], relative advantages and compatibility, as well as complexity, are the major components of the qualities of innovation that explain an organization's preparedness to adopt the technology. Consequently, the decision-maker could perceive the relative advantage of ICT so that they allocate resources for its adoption of it [2]. Complexity is believed to have a negative relationship with the diffusion of innovation because increasingly complicated technologies necessitate the acquisition of new skills and knowledge by human resources such as employees [42]. Accordingly:

H2. Organizational resource readiness will be positively (negatively) influenced by relative advantage and compatibility (complexity) (H2a-H2c), and this organizational resource readiness will serve as a mediating variable (H2d-H2f), which is expected to positively affect SMEs' adoption of E-commerce.

2.4 The innovativeness

The innovativeness captures the relative speed of adoption of an individual or other unit compared with other members of the social system [43]. In the ICT innovation diffusion and adoption, innovativeness is one of the significant factors that has been explored widely, while the background of innovativeness increases the probability of more positive decisions on adopting new technological innovations [44]. In general, innovativeness addresses the openness to accept new ideas and new methods in processing information, solving problems, and making decisions [45]. In the proposed framework, innovativeness has been identified as a critical moderator in the relationships between both managers' attitudes and E-commerce adoption, and also between organizational readiness and E-commerce adoption [5, 17].

Concerning the interaction effect of attitude and innovativeness on the E-commerce adoption, the meta-analysis model introduced by Vagnani et al. [12] suggests that the innovation life cycle moderates the managers' behavioral preferences (i.e., attitude), organization's resources, and adoption decisions. Inspired by Vagnani et al.'s statement, we have included interactions of innovativeness between decision makers' attitudes and innovation adoption toward the E-commerce system. Several prior studies have suggested examining the moderating effect of innovativeness on attitude and innovation adoption [5, 17, 18, 46].

For example, Boateng et al. [47] and Ghobakhloo and Tang [48] argued that innovativeness is crucial to obtain insight into the attitudes of individuals toward the use of technical innovation or the E-commerce application. Meanwhile, innovativeness in E-commerce technology has reported a positive impact on the attitude toward adopting the E-commerce platform [49]. Following this line of analysis, innovativeness may strengthen the effect of attitude on E-commerce adoption and maximize the explanatory and analytical of the currently proposed model. As such, organizations with more innovative managers/owners, more are likely to have a positive attitude toward using the analytical tools of information systems [18, 46].

Regarding the interaction effect of organizational readiness and innovativeness on E-commerce adoption, Marcati et al. [45] claimed that innovativeness is linked to the ability to adapt innovation and its applications faster than others in the same social setting. Mohtaramzadeh et al. [22] conclude that senior managers who have the incentive to innovate are likely to be a positive attitude towards technology implementation and allocated resources to acquire and implement it. Following these results, innovativeness, as a personality trait, can be a forceful factor in the determinants of E-commerce application adoption, such as organizational readiness. Following the definition of innovativeness, Rogers [43] suggested that an individual with higher levels of innovativeness seeks to introduce new ideas and use his advanced and challenging knowledge and experience to usefully manage the uncertainties in the business environment freely and earlier than others. Among the different typologies of innovativeness, Hong et al. [36] showed that the notion of innovativeness is often used to describe the process of adopting new ideas that individuals or firms agree to change.

In sum, the effect of the attitude on using technology is likely to be more effective for those with high levels of innovativeness than those with low levels of innovativeness. In particular, the owners/managers with a high level of innovation believes that E-commerce makes firms show more innovation, promote distribution operations, uses information and resources better, and makes SMEs operate as large company [5]. Therefore, innovativeness is expected to moderate the relationship between attitude, organizational readiness, and the adoption of E-commerce. Consequently, the following hypothesis is posited:

H3: Innovativeness moderates the relationship between attitude (H3a), organizational readiness (H3b), and SME's adoption of E-commerce.

3. RESEARCH METHODS

3.1 Sample and procedure

A questionnaire survey of this study was used for the data collection from SME owners/managers in Kuwait. Given that the majority of SMEs' owners and managers largely rely on Arabic. Consequently, using a back-translation approach, experienced translators converted the original English-language version of the questionnaire into Arabic. Differences and ambiguities between both versions were identified and corrected by the translator. Only small minor corrections were needed since both versions were relatively similar. Purposive sampling was used to collect data from owner-managers of SMEs in Kuwait. It was chosen to ensure used to reach rights owners/managers who the researcher believed possessed relevant experience with E-commerce adoption and who had sufficient time and were willing to participate. Thus, obtaining the responses within the frame of the sample from the interested respondents, as well as their availability to contribute to the study. The advantage here is that the participants participate in their initiative and will not be selected against their will.

Fourthly, this technique was chosen to enhance the response rate because respondents in this sector, especially in Kuwait, in addition to the culture of society, are reluctant to give information because they believe that information related to their business may leak out to competitors and expose them to tax the authorities. Enterprises with less than 500,000 KD were considered based on the classification of The Kuwait National Fund for SMEs Development (KNF) as small and medium-firm. According to the World Bank [50], the number of SMEs was 33,000 SMEs across different sectors. The population of the study comprises 847 managers of SMEs in Kuwait. SMEs are the focus of the study for two reasons. First, there is little research conducted in the context of SMEs in Kuwait. Second, this study aims to evaluate the attributes of innovations in E-commerce adoption in this sector. In conclusion, the results of the pilot study were unproblematic, thus the main survey, which gathered information from SMEs in Kuwait, employed the same questionnaire.

For this study, the essential respondents who were thought to be likely to participate were surveyed both online and in person. Due to the nature of SMEs in Kuwait, a personal managed strategy was required for this research to obtain the necessary

number of replies. At the same time, this will guarantee that the research findings are not impacted by non-response bias. While the online survey was conducted to guarantee a larger reach of respondents in a brief amount of time. There was no expectation of disagreement among the owners and managers of SMEs who answered the online and individually delivered surveys because they had the same characteristics and were made aware of the study's academic goal. The individuals who are responsible for deciding final decision-making regarding innovation-related matters in the firm are targeted in the questionnaire. Accordingly, the ultimate responsibility for most of or most of the critical decisions in the organization, such as budget, finance, and maintenance, and, making the best solutions to solve the problems to benefit the organization lies with the leaders [9,44]. Participation in the survey was completely voluntary and no incentives were provided.

To evaluate the validity and reliability of the measuring items, pilot research was carried out. The indicators are valid for measuring the constructs in the questionnaire, according to the results of the A Cronbach's alpha reliability test, which range from 0.634 to 0.837 for various constructs [51]. About 874 participants were chosen in all, however, only 272 of those returned the surveys, for a response rate of 32.11 percent. As 13 questionnaires were disregarded after the data filtering and scanning process because the answers to the questions were discovered to be false. Thus, 259 full and useful surveys in total were chosen for further examination. This represents a 30.57 percent response rate, which is enough to analyze the data. The number of questionnaires sent to SMEs through online surveys based on Google forms. Out of 259 questionnaires, 214 were early respondents and 45 were late respondents. The non-response bias has no impact on the results because an independent sample t-test reveals no differences in the mean scores of all the research variables between these two groups.

The majority of respondents were 103 manufacturing (39.8 percent), 35 tradings (13.5 percent), 7 constructions (2.7 percent), and 5 agriculture (1.9 percent). As for the respondents' level of education, the majority had a bachelor's degree (52.1%). In terms of work experience, 33.6 % of SMEs have experienced less than 5, while 30.5% of the sampled SMEs have entrepreneurial experience between 5 and 10 years. Finally, most of the sampled SMEs have employees ranging between 11 and 100 about 121 (46.7 percent), while 96 SMEs (37.1 percent) have employees less than ten.

3.2 Measurements

To make it easier for respondents to choose an option, the questionnaire included a series of statements using a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree). However, this research modified several items to fit the context of the present study. In terms of measurement, the first independent variable of perceived relative advantage was measured using [20, 52] five items. Next, the measurement of the perceived compatibility comprised four items [23, 34]. Perceived complexity was measured using four items [2, 34]. Regarding the mediator, firstly, the attitude scale used in this work was adapted from Al-Jabri and Roztocki [30] using the five items, such as "I generally have a favorable attitude toward using the E-commerce technology".

Secondly, organizational resource readiness is comprised of financial resources and technological resources. which were measured using four items from past studies [22, 23]. Regarding the moderator, four items were used to measure innovativeness adapted from Boateng et al. [47] and AlBar and Hoque [1]. For the dependent variable of E-commerce adoption, this research focused on four measurement items adapted from the study of Voola et al.[53] to measure the variable. For example, “Our enterprise provides general information about its products or services through its website”.

4. Data Analysis and results

The SmartPLS software is used based on partial least squares structural equation modelling (PLS-SEM) to evaluate the hypotheses in this study [54]. PLS-SEM is considered most appropriate for this research since it allows testing the effects of two mediation variables simultaneously [23,55]. PLS-SEM is a variance-based method to estimate path models with moderating variable that involves the interaction between exogenous latent variables and endogenous latent variables[56]. A non-parametric resampling technique called bootstrapping is used to test hypotheses even when the sample size is small. To create a new sample with the same size as the original sample, the bootstrapping technique comprises sampling the data rows with replacement [57].

Therefore, the authors used the ‘bootstrapping’ resampling method (5,000 resamples) to assess the statistical significance of the path coefficients and the p-values. The main purpose of bootstrapping is to measure overall model fit, analyze the statistical significance of the estimated coefficient, and compute the bootstrap standard error (t and p values) [58]. A bias-corrected 95% confidence interval was employed together with 259 data instances with an indirect effect technique to examine the mediation effect based on the PLS approach [57, 59]. PLS-SEM estimates complex models with many constructs including mediating variables. To assess the mediation hypotheses, we used the bootstrapping indirect effect technique of SmartPLS-SEM, which is a suitable method for testing mediation effects where a feature is available to complete an indirect effect with various options[57].

4.1 Measurement model assessment

The measurement model of the reflective latent variables was assessed through tests of indicator reliability, internal consistency, convergent validity, and discriminant validity using recommended guidelines[57]. The examination of the individual item reliability results was identified and all items demonstrated acceptable factor loadings of more than the minimum threshold of 0.708 [49, see Table 1]. Similarly, Cronbach’s alpha and composite reliability (CR) was higher than the acceptable value (0.70) and varied from 0.854 to 0.928, indicating sufficient construct reliability [57]. Furthermore, loadings for Dijkstra- Henseler's rho, a potential substitute for Cronbach's alpha, is higher than 0.70, indicating the data were trustworthy. Convergent and discriminant validity of the construct were examined, and the average extracted variance (AVE) was compared, to assess its validity. The results in Table 1 demonstrate that all constructs, ranging between 0.648 and 0.750, are well over the cutoff value of 0.50. This

establishes convergent validity since all of the constructs have stronger relationships with their measures than they do with any other variables.

Table 1. Latent constructs assessment using a measurement model

Construct	Item	loading	alpha	rho_A	CR	AVE
Attitude	ATT1	0.799	0.902	0.905	0.928	0.719
	ATT2	0.870				
	ATT3	0.864				
	ATT4	0.869				
	ATT5	0.838				
E-commerce adoption	ECA1	0.884	0.851	0.86	0.9	0.695
	ECA2	0.903				
	ECA3	0.769				
	ECA4	0.769				
Innovativeness	INN1	0.794	0.82	0.825	0.88	0.648
	INN2	0.800				
	INN3	0.793				
	INN4	0.832				
Organizational resources readiness	OGR1	0.880	0.888	0.890	0.923	0.75
	OGR2	0.909				
	OGR3	0.844				
	OGR4	0.829				
Perceived compatibility	PCO1	0.851	0.848	0.854	0.898	0.689
	PCO2	0.868				
	PCO3	0.860				
	PCO4	0.734				
Perceived complexity	PCX1	0.804	0.743	0.746	0.854	0.661
	PCX2	0.848				
	PCX3	0.786				
Perceived relative advantages	PRA2	0.804	0.873	0.874	0.913	0.724
	PRA3	0.869				
	PRA4	0.875				
	PRA5	0.854				

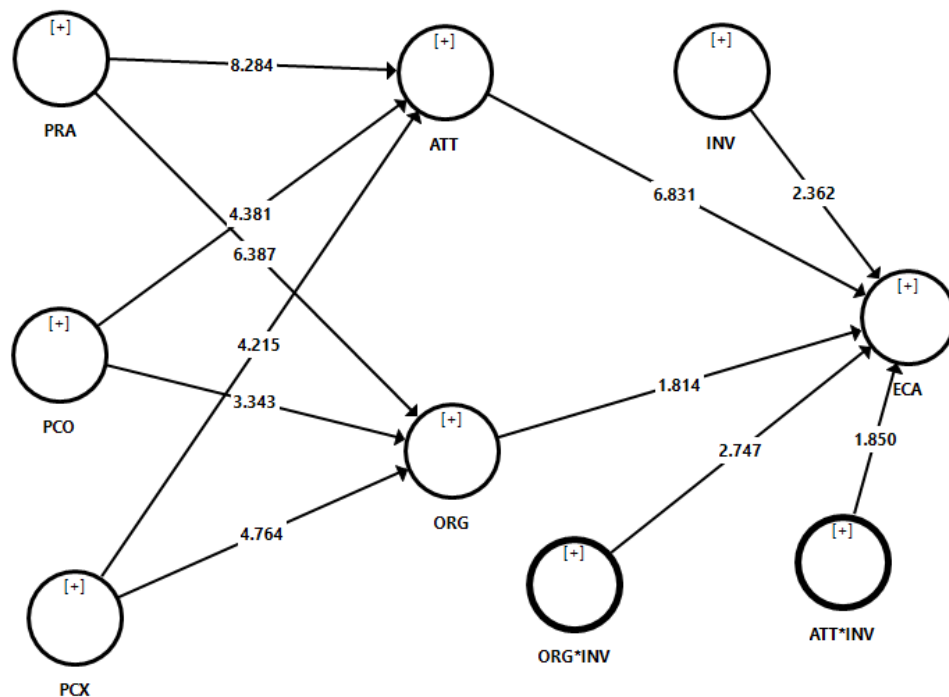
Also, for the discriminant validity, using the heterotrait-monotrait (HTMT) criterion, which measures the average correlations of the indicators across constructs. In testing the discriminant validity, the HTMT of all constructs should be passed the HTMT0.90 and also the HTMT0.85 [60]. Lastly, findings showed that the estimated HTMT ratios were more than the HTMT value of 0.85 (Table 2). Therefore, it may be said that an estimate of the discriminant validity has been made.

Table 2. Discriminant validity (HTMT criterion)

	ATT	ECA	INV	ORG	PCO	PCX	PRA
ATT							
ECA	0.831						
INV	0.611	0.612					
ORG	0.844	0.735	0.664				
PCO	0.726	0.623	0.498	0.668			
PCX	0.750	0.678	0.512	0.749	0.654		
PRA	0.836	0.747	0.566	0.786	0.605	0.648	

4.2 Evaluation of structural models and testing of hypotheses

The path coefficients (t & beta values), determination coefficient (R^2), predictive relevance (Q^2), and effect size (f^2) of the suggested research framework were used to assess the structural model [57]. The hypothesized correlations were estimated at a 1-tailed test with a 0.05 level of significance (Figure 2). In addition to analyzing the R^2 , the model is assessed by observing the Q^2 predictive relevance using the SmartPLS blindfolding method with an omitting distance of 6. The Stone-Gessers Q^2 value should be greater than zero for endogenous constructs to show great predictive relevance to the proposed model [57]. Also, as a rule of thumb, values of 0.02 (small), 0.15 (medium), and 0.35 (large) are used to assess the effect size of a model [61].

**Figure 2.** Structural model

As reported in Table 3, perceived relative advantages ($\beta = 0.491$, $t = 8.284$, $p < .001$) and perceived compatibility ($\beta = 0.269$, $t = 4.381$, $p < .001$) have positive impact on attitude. Similarly, perceived relative advantages ($\beta = 0.442$, $t = 6.387$, $p < .001$) and

perceived compatibility have positive impact on organizational resources readiness. However, perceived complexity has a negative and significant influence on attitude ($\beta = -0.219$, $t = 4.215$, $p < .001$) and organizational readiness ($\beta = -0.272$, $t = 4.764$, $p < .001$) as depicted in Figure 2. Thus, hypotheses H1a-H1c and H2a-H2c are fully supported.

The structural relative advantages, compatibility, and complexity explain 66.7% and 59.4% of the variance in attitude and organizational readiness respectively. The f^2 results of relative advantages (0.470), compatibility (0.142), and complexity (0.094), respectively, reveal a large, medium, and small effect on attitude. Likewise, the relative advantages (0.309) have a slightly large effect on organizational readiness, while compatibility (0.070), and complexity (0.118), respectively, reveal a small effect on organizational readiness. In addition, attitude ($\beta = 0.512$, $t = 6.831$, $p < .001$), organizational readiness ($\beta = 0.130$, $t = 1.814$, $p < 0.05$), innovativeness ($\beta = 0.135$, $t = 2.362$, $p < .001$), have a positive and significant impact on E-commerce adoption. For R^2 , the structural model of the three significant factors explains 57.9% of the variance in E-commerce adoption. Besides, attitude (0.475), organizational readiness (0.437), and innovativeness (0.394) demonstrate a significant effect on E-commerce adoption. Regarding Q^2 , the value of 0.475 for attitude, 0.437 for organizational readiness, and 0.394 for E-commerce adoption shows that the structural model has satisfactory predictive relevance.

Table 3. PLS output after bootstrapping.

Relationship	Beta	SD	T Statistics	P Values	5.0%	95.0%	f ²	Q2
Influence of innovation attributes on attitude (H1a-H1c)								
PRA -> ATT	0.491	0.059	8.284***	0.000	0.391	0.585	0.470	
PCO -> ATT	0.269	0.061	4.381***	0.000	0.166	0.370	0.142	
PCX -> ATT	-0.219	0.052	4.215***	0.000	-0.308	-0.134	0.094	
Influence of innovation attributes on organizational resource readiness (H2a-H2c)								
PRA -> ORG	0.442	0.069	6.387***	0.000	0.319	0.547	0.309	
PCO -> ORG	0.210	0.063	3.343***	0.000	0.108	0.315	0.070	
PCX -> ORG	-0.272	0.057	4.764***	0.000	-0.370	-0.182	0.118	
Influence of attitude, organizational resource readiness, and innovativeness on adoption								
ATT -> ECA_	0.512	0.075	6.831***	0.000	0.377	0.623	0.245	0.475
ORG -> ECA_	0.130	0.071	1.814**	0.035	0.007	0.245	0.015	0.437
INV -> ECA_	0.135	0.057	2.362**	0.009	0.044	0.232	0.027	0.394
The mediating of attitude (H1d-H1f)								
PRA -> ATT -> ECA_	0.251	0.052	4.863***	0.000	0.166	0.334		
PCO -> ATT -> ECA_	0.137	0.037	3.673***	0.000	0.076	0.201		
PCX -> ATT -> ECA_	-0.112	0.030	3.677***	0.000	-0.164	-0.062		
The mediating of organizational resource readiness (H2d-H2f)								
PRA -> ORG -> ECA_	0.057	0.035	1.658**	0.049	0.003	0.117		
PCO -> ORG -> ECA_	0.027	0.017	1.585*	0.056	0.001	0.056		
PCX -> ORG -> ECA_	-0.035	0.021	1.688**	0.046	-0.070	-0.002		
The moderating of innovativeness (H3a-H3b)								
ATT*INV -> ECA_	0.126	0.068	1.850**	0.032	-0.001	0.221	0.017	
ORG*INV -> ECA_	-0.179	0.065	2.747***	0.003	-0.274	-0.059	0.033	
R2 before interaction	ATT=R ² =0.667		ECA=R ² =0.579		ORG= R ² =0.594			
R2 after interaction	ATT=R ² =0.671		ECA=R ² =0.565		ORG= R ² =0.594			
SRMS=0.65								

*** $p < 0.001$, ** $p < 0.05$, * $p < 0.1$.

4.3 Mediating effects

As shown in Table 3, the indirect effects of perceived relative advantages ($\beta = 0.251$, $t = 4.863$, $p < 0.01$, 95% CI: 0.166 to 0.334), perceived compatibility ($\beta = 0.137$, $t = 3.673$, $p < 0.01$, 95% CI: 0.076 to 0.201), perceived complexity ($\beta = -0.112$, $t = 3.677$, $p < 0.01$, 95% CI: -0.164 to -0.062) on E-commerce adoption via attitude given that the 95 percent confidence interval did not cross 0, each was significant [62], supporting H1e – H1f, respectively. Secondly, the indirect effects of perceived relative advantages ($\beta = 0.057$, $t = 1.658$, $p < 0.05$, 95% CI: 0.003 to 0.117), perceived compatibility ($\beta = 0.027$, $t = 1.585$, $p < 0.1$, 95% CI: -0.001 to 0.056), perceived complexity ($\beta = -0.035$, $t = 1.688$, $p < 0.1$, 95% CI: -0.070 to -0.002) on E-commerce adoption via organizational readiness were all significant, since the 95 percent confidence interval did not cross zero, supporting H2d - H2f respectively.

4.4 Moderating effect

The results of testing moderating indicate that the inclusion of interactions (attitude X innovativeness and organizational readiness X innovativeness) further improved the model and hence generated additional insights. The inclusion of interactions increased the proportion of variance explained by the attitude which increased to 0.671 percent. The results in Table 3 revealed that innovativeness successfully moderate positively the relationship between attitude ($\beta = 0.126$, $t = 1.850$, $p < .005$) and E-commerce adoption and negatively between organizational readiness ($\beta = -0.179$, $t = 2.747$, $p < .001$). For f^2 , the interaction of attitude and innovativeness (0.017) and interaction of organizational readiness and innovativeness (0.03) on E-commerce adoption demonstrate a medium effect, respectively, and thus H3 is fully supported.

5. CONCLUSIONS AND SUGGESTIONS

5.1 Discussion

The results of this study demonstrate the predictive power of innovation attributes within an E-commerce adoption model. In particular, the findings confirm that the innovation attributes have significant and positive relationships with attitude and organizational resource readiness. The results also confirm that E-commerce adoption can also be improved by enhancing relative advantage, comparability, and lower complexity, and through the mediation of both attitude and organizational readiness. The findings then prove that three innovation attributes are significant predictors of E-commerce adoption indirectly attitude and organizational resource readiness.

Several deductions can be drawn from this study. In particular, our results support the idea of the assertion of the DOI by confirming the positive influence of relative advantage, perceived compatibility, and lower complexity on the attitude towards the adoption of E-commerce and organizational resource readiness, which is consistent with previous findings. In addition, we found that complexity in attitude is significant, which may lead to a lower managers' attitude toward using it will work as a barrier to adoption [e.g., 7, 8, 10, 11, 43]. This result is consistent with the theory that SMEs are aware of the advantages of adopting new technology, as it is well documented in the literature on innovation dissemination [e.g., 6,7].

These findings agree with Maduku et al. [25] Davis [7] and Rogers [43], who indicated that relative advantage is associated with a higher attitude toward the adoption, and use of e-commerce technology. The results also agree with the study of Wang et al.[39] on the mediating of attitude towards adoption technology. In addition, our results shed light on the positive and crucial role of the relative advantage and compatibility on organizational resource readiness and while complexity has a negative relationship supporting Vagnani et al. et al.[12] meta-analysis conclusion. Indeed, adjustment of the relationship between innovation attributes and organizational resources is consistent with both DOI and TPB theories for adoption decisions and has provided empirical support for the assertion and Tornatzky and Fleischer [10] framework which establishes factors that affect resource readiness for adoption.

Besides, our findings suggest that organizational resource readiness has a significant impact on E-commerce adoption for SMEs. The results indicate that SMEs are likely to adopt E-commerce systems when the resources of the technology and infrastructure to support the application of advanced technology systems are available and adequate. Ocloo et al. [6] suggest that regardless of the business type, an organization's resource readiness has a positive and significant impact on the different levels of E-commerce adoption in SMEs. This means if an organization's readiness increases the level of E-commerce adoption also increases. This outcome is consistent with contemporary studies, such as Rahayu and Day [41], who reported similar results in Indonesian SMEs. The result indicated that innovativeness affects E-commerce adoption. Whereas innovative owner-managers will be more inclined to use this technology because they are likely to demonstrate a positive attitude towards the new technology and influence others to create a positive attitude towards acceptance of the latest technology [29].

The literature on the connection between innovation traits and adoption, however, has produced conflicting results [2]. Therefore, these authors investigated that attitude and organizational readiness play mediating roles. The argument that led to the decision to use these mediations is the attributes of technology are important in its adoption but sometimes not enough, where relative advantage and compatibility need an intervening factor to translate their potential benefits for performance and the efficiency of SMEs' business. Using a sample of SMEs in Kuwait, the results of the studied data show that the proposed hypotheses are well supported. The result proved that attitude and organizational readiness substantially supports the link between innovative characteristics and the adoption of E-commerce. The mediation model in this study confirms and extends previous studies [9, 12, 36] by providing organizational readiness and attitude, simultaneously responsible for the relationship between innovation attributes and the E-commerce adoption of SMEs.

Further, we noticed a significant impact of managers/owners' innovativeness as a categorical moderator of the relationship between attitude and E-commerce adoption. In turn, the greater managers' innovativeness, which upholds the experience and ability of the owner to deal with technology, will likely increase the tendency to be adopted E-commerce. Moreover, innovativeness is thought to be attributable to top management characteristics that tight to strengthening the relationship between attitude and adoption of E-commerce as an outcome variable. For example, Grandón and Ramírez-Correa [5] found in an attempt to determine the moderate impact of innovativeness, that the attitude is significantly linked to the intention of E-commerce adoption in the case of the owner/manager's less and more innovative. In other words, less innovative owners/managers realize that their organizational resources have no barriers to adopting E-commerce. In the other words, for managers/owners of SMEs with a low level of innovativeness, organizational readiness is a key predictor of E-commerce adoption.

5.1 Theoretical implications

In this paper, we presented a framework that contains two mediators (attitude and organizational resource readiness) between the attributes of innovation–E-commerce

adoption relationships and moderated by the innovativeness based on DOI and TPB. This paradigm and the results made available paint a more nuanced and complex picture of the characteristics of innovation. Responding to Vagnani et al.'s [12] and Vagnani and Volpe's [9] call, we answered their identified research needs: (a) for more and better multidimensional perspective research, (b) additional tests of underlying mechanisms for attributes of innovation–adoption decision linkages in the context of E-commerce innovation, and (c) to include innovativeness in the chains of attributes of innovation–the mediator–adoption decision in an organization. To respond to their call, we provide a better understanding of the attributes of innovation, particularly the relative advantages, compatibility, and complexity in the context of E-commerce adoption in SMEs via considering the mechanisms and the conditions of attitude and organizational readiness.

The findings of this study demonstrate the role of attributes of innovation of DOI often display indirect effects on E-commerce adoption through TPB variables such as attitude and organizational resource readiness, and thus the mentioned theories have been extended. These mediating effects may help SMEs convert the possible benefits of innovation attributes into greater E-commerce adoption among SMEs. The main view of the DOI and TPB is that innovation attributes are assumed to influence the adoption decisions made by managers in organizations and can be mediated by attitude and organizational readiness. Finally, we have satisfied the other calls to include the innovativeness to understand better the nature and magnitude of the relationships between mediated variables and innovation adoption, answering Vagnani et al.'s [12] call.

5.2 Practical implications

The results of this study provide important practical implications for policymakers' SMEs linkage in the context of the GCC countries, especially in Kuwait. As predicted in this research, the more innovation attributes the better the attitude and organizational readiness which in turn increases E-commerce adoption, the impact of attitude and organizational readiness is dependent on the level of innovativeness. This infers that SMEs should understand the innovation attributes to improve their E-commerce adoption. However, not all SMEs know and, or capabilities for E-commerce adoption to be realized. Here, government bodies can play a role by providing training and policies to encourage E-commerce adoption in dynamic environments. For example, in highly dynamic environments, SMEs may need more access to financial resources and training programs to support them in being a more positive attitude towards innovation. Hence, the results of the study will be important for policymakers such as the Kuwait National Fund for Small and Medium Enterprises Development, and the Ministry of Commerce and Industry, in designing policies to stimulate the attitudes of owners/managers towards the adoption of E-commerce in the country.

This understanding and awareness may weigh the value of policymakers to make the right decisions to create more advertising and awareness campaigns designed for owners/managers of SMEs. It can keep them informed and increase their knowledge of

the comparative advantage and benefits gained from E-commerce systems in their business operations. More so, SME managers must also recognize that the effects of innovation attributes (particularly relative advantage, compatibility, and complexity) on the decision to adopt E-commerce are mediated mainly by the impact on their attitude toward E-commerce adoption and organizational resource readiness.

The findings also indicate that managers need to pay close attention to demonstrating a commitment to providing support and resources for adopting E-commerce innovation. In line with Vagnani and Volpe [9], the study suggests that SMEs business managers can improve E-commerce adoption and its use by investing resources to increase the perception of relative advantage and compatibility of the E-commerce system not only by the SMEs that adopt the target but also by the partners with whom these target SMEs are associated. Moreover, the moderating impact of innovativeness on the connection between both attitude and organizational resource readiness and E-commerce adoption is supported in this research. The higher innovativeness among managers increases adoption when aligned to attitude, and even the organization is less ready than lower innovativeness. Hence with a positive attitude, SMEs can leverage the managers' E-commerce adoption by establishing innovativeness relationships. Therefore, this research provides empirical support for the importance of innovativeness in managing their attitudes toward E-commerce.

5.3 Limitations and future research

Like all studies, this one has some restrictions. First of all, our empirical analyses cannot take changes over time into account due to the cross-sectional sample used in the study. Future studies would solve limitations with a longitudinal investigation. Second, this study was conducted in Kuwait, in which a single, and relatively small developing country characterized by a particular economic status, which is the 20th largest country in the world in terms of GDP per capita, depending on the oil, market size, as well as cultural background. As a result, care should be taken when extrapolating the findings from this study regarding Kuwait to other nations. To increase the generalizability of the findings, it is advised to repeat this study in several nations. This study concentrates on attitude and organizational resource readiness as conditions that can influence the innovation attributes - E-commerce adoption relationships. Therefore, future researchers may wish to suggest other potential mediators and even combine them with the moderators for the linkage of additional attributes innovation to E-commerce adoption in the context of SMEs. In addition, the study may have ignored some moderating effects related to organizational resource readiness and the E-commerce adoption relationship that may elucidate the relationships within the model. Future research may incorporate more moderating effects.

6. Conclusion

The study conducted not only tests and validates the current findings but also reinforces the existing knowledge based on a newly derived model from DOI, TPB, and previous theoretical models in which innovation attributes influence the decision to adopt E-

commerce among SMEs in Kuwait. Thus, the research conducted attempts to examine the mediating role of managers' attitudes and organizational resource readiness regarding innovation attributes - the adoption of E-commerce in SMEs. Furthermore, the authors used PLS-SEM via SmartPLS 3.0 to analyze the associations between the attributes of innovations, the attitude of managers, organizational resource readiness, and SMEs' E-commerce adoption in a mediated-moderated framework. The findings have made an effort to promote the use of E-commerce literature by shedding light on the processes that impact innovative factors that influence SMEs' adoption of E-commerce.

The outcomes of this study concluded that the attitude of managers and organizational resource readiness considering as the mechanisms that may explain positive and reverse relationships between innovation attributes and E-commerce adoption in the context of SMEs. It is also concluded from the moderation analysis that innovativeness has played a significant moderating effect on the attitude of managers and organizational resource readiness, and E-commerce adoption. Finally, it is concluded that the considered conceptual model has been validated from the results of an undertaken study for both direct and indirect relationships amongst the variables. Hence, the outcomes of the undertaken research specify the new aspects that influence the attitude of managers and organizational resource readiness towards the adoption of E-commerce. Therefore, this study will also benefit the practitioners in SMEs to focus on innovation attributes and their mechanisms to foster or hamper the diffusion of E-commerce technologies in their SMEs business.

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