



ICTs ADOPTION DECISION IN PAKISTANI SMEs: MEDIATING ROLE OF OWNER/MANAGERS WITH THE LENS OF ORGANIZATIONAL AND TECHNOLOGICAL CONTEXT OF T-O-E FRAMEWORK

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ARTICLE INFO	ABSTRACT
<p><i>Article history:</i> Received 15 February 2019 Received in revised form 30 April 2019 Accepted 27 May 2019 Available online 30 May 2019</p> <p><i>Keywords:</i> E-business; Computerization; Innovation; MIS; Adoption process; Adoption decision.</p>	<p>This study investigated the mediating role of owner/manager in the adoption of ICTs among Pakistani SMEs whiling using the organizational and technological context of T-O-E framework. Data were collected from owners/ managers of registered SMEs in Lahore chamber of commerce and trade (N= 223). The empirical results revealed the owner/manager role mediates the link between firm resources, firms size, complexity, compatibility, and SMEs decision to adopt ICTs. Findings of this study indicate that owner/managers can play a significant role in shaping the SMEs decision towards using ICTs. Furthermore, by taking such a decision, SMEs can survive and compete in a complex and ever-changing business environment.</p> <p>© 2019 INT TRANS J ENG MANAG SCI TECH.</p>

1. INTRODUCTION

From early 1990, tremendous development in information and communication technologies (ICTs) persuade the organizations to restructure them self, overview their business strategies and adopt these technologies to meet the requirements and expectations of customers and suppliers (Oh, Cruickshank & Anderson, 2009). These new ICTs can help the organizations in many ways for example to generate, evaluate, process, communicate, collect, recover, sort, store and transform the important data. It was found by Talukder et al. (2013) that all the technologies like telephone, fax, printers, PC, internet, soft applications, world wide web and email can be termed as ICTs. Apulu and Latham (2009); Porter and Millar (1985) stated that ICTs is a broad terminology which includes a broad variety of hardware and software, internet, world wide web, applications, and gadgets.

Organizational performance of small-scale firms is significantly impacted by their investment in implementing the computerization. Prior literature like Koellinger (2008), Brynjolfsson and Hitt (2000) revealed that with the effective utilization of computers and related technologies, organizational productivity could be increased at national and global levels.

Rich literature is available which recognizes the range of different determinants that effects the SMEs decision to adopt new advanced technological innovations (Harker & Van 2002). To examine and understand the advantages of ICTs, numerous scholars proposed theories and framework especially in the area of the information system, MIS, technology management, e-business. Some examples are (Oh et al. 2009; Ayanso et al. 2010; Badescu, & Garces-Ayerbe, 2009; Abbasi et al., 2019).

Bruque (2007) and Nguyen (2009) explain that in small and medium businesses, the decision about adopting and using new IT technologies heavily depends upon the owner/managers because their role is critical in routine matters to future investment. This is quite possible because most small businesses have a narrow and centralized firm structure where the owner and manager are often the same individuals (Ghobakhloo et al., 2011). This study aims to assess the mediating role of owner/managers in ICT adoption decision making in SMEs with the application of organizational and technological context of T-O-E framework. This framework is widely used to understand the adoption of new IT innovations at the firm level.

2. LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

Technology Organization and Environment framework (TOE) is developed by Tornatzky and Fleischer (1990). Taylor (2015) found that this framework identifies three aspects of an enterprise's context that influence the process by which it adopts and implements ICT innovations: these are technological, organizational and environmental context. This study considered organizational and technological contexts of the framework and both contexts have three crucial determinants of ICTs adoption found in the literature.

2.1 ORGANIZATIONAL CONTEXT

All the features and resources of the organization like firm size, communication process among the organizations, financial resources, and the firm's culture are included in this organizational context. In an organizational context, so many factors that affect innovation, have been studied but the size and financial resources are the two factors which are most discussed. Rogers (1995) stated that a lot of research shows that financial resources are crucial in the adoption of ICTs. In contrast, some studies revealed that financial resources are not a compulsory element for promoting innovation (Tornatzky et al., 1983). For this study, following three determinants of ICTs are included in this context.

2.1.1 FIRM RESOURCES

According to Rangone (1999), based on resource theory, for success and healthy performance of small businesses, financial assets consider the most prominent and crucial success element. Fuller-Love (2006) argued that most small businesses faced the problem of scarcity of financial resources and in most cases, top-management invest their own money. Scarcity of financial resources makes small business conscious to invest and financial expenditures (Ghobakhloo et al., 2011); Benitez-Amado, 2011). Thong and Yap (1995) found that only those small firms that have sufficient capital would be able to invest in adopting new IT technologies. Therefore, adopting the required and desires information system, small business's management must possess access to financial assets (Lybaert,1998). These results are consistent with Thonganan (2001) who conducted a study inthe

Singaporean small businesses and found that investment in information system is second most crucial factor for successful implementation if IS after the external expertise.

2.1.2 SIZE OF THE FIRM

For small and medium businesses firm size can be measured by total assets/ annual turnover or number of employees. Firm size is also considered as a prominent determinant for the adoption of ICTs in SMEs (Premkumar 2003; Thong & Yap1995). A study conducted by Rahayu and Day (2015) found that within an organizational context, firm size is an important determinant of adoption of e-commerce in Indonesian small businesses. Among the other factors, the most important factor which hindering the adoption of internet technology is a small firm size (Teo and Tan,1998). While taking a comparison, Thong (1999) and Thong and Yap (1995a) argue that small firms are running behind in the adoption of innovations as compared to large firms due to lack of resources, lack of professional skills, tough competitive pressure, lack of financial resources and less government support.

2.2 TECHNOLOGICAL CONTEXT

All those technologies which are relevant to the firm whether they are being used in the firm or available in the market but not in use are included in this technology context. Collins and Hussey (2013) revealed that a firm's current technologies play an important role in the adoption of new technology because they identify the scope and pace of these new technologies which are going to be adopted. Tushman and Nadler (1986) found that technologies which are available but still in not use by firms are also important for adoption of technology. Further, their importance is twofold as they determine the limits and presenting the ways through which firms can evolve and adopt them. This context of the TOE framework includes two determinants which are:

2.2.1 COMPLEXITY

All the difficulties/complexities/obstacles in adopting, understanding and implementing the specific technology refer to complexity. Elbeltagi (2007) defines complexity as “the degree to which an innovation is perceived to be relatively difficult to comprehend and use”. García-Murillo (2004) argued that a strong relationship exists between the level of complexity and IT adoption. Further on the basis of past experience, complexity negatively related to new IT technology and future technology will not be adopted (Kim, Fiore & Lee, 2007). Al-Qirim (2005) found that very few firms are willing to train their employees to enhance their expertise and reason behind this is that they think spending time on employee training is wastage of time. Usually, organizations recruited already trained individuals rather train them after recruitment.

2.2.2 COMPATIBILITY

Definition of compatibility given by Rogers (1995) stated as “the degree to which technological innovation is perceived as being consistent with existing operating practices, beliefs, values, past experiences, and needs”. Tornatzky and Fleischer (1990) stated that the new idea will be adopted on the basis of experience of a past idea as well as on the success or failure of a past idea. Firms will adopt new IT technologies if they believed that new technology is compatible with existing firm's values, culture or system and there will be less resistance within firm against adopted technology (Brown & Kaewkitipong, 2009, Mndzebele, 2013). Compatibility is considered as a crucial factor to adopt new IT technology because at the implementation stage, firms do not want any compatibility problem (Kim et al., 2007).

2.3 ADOPTION DECISION

Thong (1999) argued that the use of computer/internet and other related technologies for example e-business or e-commerce enhance the firm capabilities to compete in the competitive market. Similarly internet capable the small firm to increase market share and find the new window of opportunities (Quaddus & Achjari, 2005). By adopting new IT technology, an organization can get a competitive edge over its rivals in the market. Moreover, employees could also be motivated to actively participate in business activity by adopting new technology (Villavicencio, 2012).

H₁: Direct relationship (without mediator) is significant between organizational and technological contexts and ICT adoption decision. (Model A)

2.4 OWNER/ MANAGER'S ROLE (MEDIATOR)

Bruque (2007) and Nguyen (2009) explain that in small and medium businesses, the decision about adopting and using new IT technologies heavily depends upon the owner/managers because their role is critical in routine matters to future investment. This is quite possible because most small businesses have a narrow and centralized firm structure where the owner and manager are often the same individuals (Ghobakhloo et al., 2011). Fuller-Love (2000) and Smith (2007) referenced the many studies in which it is stated that role of top management in small businesses is vital because of all the firm activities either current or future, greatly influenced by their decisions. This also reflects on the decision regarding adopting, implementing, maintaining and using the new advanced IT technologies.

H₂: Relationship is significant between organizational and technological contexts and the owner/manager's role.

H₃: Relationship is significant between the owner/manager's role and ICT adoption decision

H₄: owner/manager's role mediates between organizational and technological contexts and ICTs adoption decision (Model B).

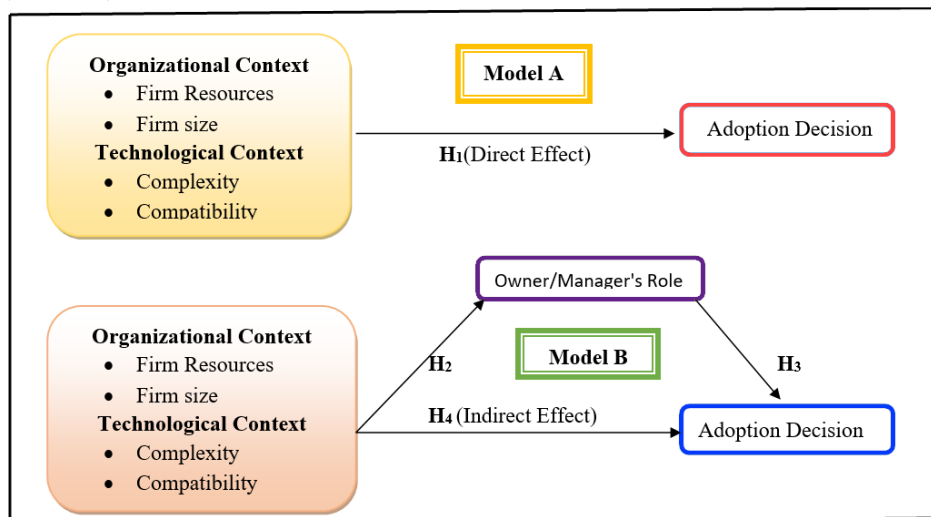


Figure 1: Conceptual Framework.

3. DATA COLLECTION

This study used survey research design. Survey data were collected from a population of SMEs operating in selected sectors (food, sports goods, cosmetics, agribusiness, glass & ceramics, iron & steel) in the city of Lahore, Pakistan. Table 1 demonstrates the sample details. The list of these SMEs with the complete address was available on the official website of the chamber. the survey questionnaire was divided into two parts. first was consist of close-ended questions which were about the demographic's characteristics of the respondents. The second part of the questionnaire was consist

of questions about the organizational and technological contexts and ICT adoption decision by SMEs with the mediating role of owner/managers. The questionnaire was distributed through conventional postal service with a return envelope. After 15 days reminder was given through mobile call and text message. To ensure the maximum response rate, 400 questionnaires were distributed. Total 223 questionnaires were returned (response rate 63%). All these activities were taking place during May and June 2018

Table 1: Sample distribution

Sr. No	Category	Registered SMEs	Owner/manager	Senior Executive	Returned
1	Food	139	107	32	84
2	Sports goods	22	19	03	15
3	Cosmetics	25	20	05	17
4	Agribusiness	37	31	06	24
5	Glass & Ceramics	34	29	05	27
6	Iron & Steel	93	64	29	56
Total		350	270	80	223

4. MEASURES

This study used a 5-point Likert scale to investigate the mediating role of owner/manager in ICT adoption decision in Pakistani SMEs with the lens of the organizational and technological context of the TOE framework. Complexity and compatibility (technological context) were measured by the items used by Al-Jabri and Sohail (2012). Firm size in this study was measured by using three indicators, which were the number of employees, total sales and total assets and these indicators were used by Sila (2013). Firm resources were measured by using four indicators adapted from Al-Qirim (2007).

Table 2: Evaluation of measurement model

Construct	Indicator	Factor loadings	Cronbach's alpha	Composite Reliability	AVE
Firm resources	FR1	.78	.86	.83	.77
	FR2	.83			
	FR3	.81			
	FR4	.77			
Firm size	FS1	.80	.89	.81	.68
	FS2	.85			
	FS3	.76			
Complexity	COMLX1	.88	.77	.88	.73
	COMLX2	.79			
	COMLX3	.88			
	COMLX4	.78			
Compatibility	COMPT1	.87	.84	.90	.71
	COMPT2	.88			
	COMPT3	.89			
Owner's role	OWN1	.82	.76	.88	.77
	OWN2	.77			
	OWN3	.79			
	OWN4	.80			

FR= Firm Resources; FS= Firm Size; COMPLX= Complexity; COMPT= Compatibility; OWN= Owner's role

5. DATA ANALYSIS

This study used structural equation modeling with partial least squares (PLS-SEM) for data analysis. PLS-SEM is assumed to be suitable for theory building and predictive application. PLS path modeling is a modern statistical technique which is used to evaluate the measurement model and

structural model. In the measurement model internal consistency (composite reliability), convergent validity (indicator reliability and average variance extracted) and discriminant validity are tested. Evaluation of structural model involves assessing the collinearity among constructs and assessing the significance and relevance of hypothesizing relationships.

6. RESULT

Table 2 indicates the factor loading of each item, Cronbach's alpha, composite reliability and average variance extracted (AVE) for the latent variables. Statistics in table 1 shows that our data is valid as well as reliable at an item and construct level. While applying the structural equation modeling, composite reliability is preferred over the Cronbach's Alpha to measure the internal consistency of the construct however it may use as a traditional measure of the internal consistency. Values of alpha and composite reliability above 0.70 indicate the internal consistency reliability of the construct. In our case, alpha and CR meets the requirements and confirmed that our data is reliable.

Besides all of the above, this study tests the discriminant validity to confirm that measures of one construct are not correlated with other constructs (Ringle et al., 2010). Traditionally two approaches are used to confirm the discriminant validity: cross-loading and Fornell and Larcker's (1981) criterion. This used both criteria to establish discriminant validity. Table 3 shows that outer loading of all the indicator on their associated construct is greater than their loadings on other constructs. So discriminant validity has been established.

Table 3: Cross Loadings

	FR	FS	COMPLX	COMPT	OWN
FR1	.74	.53	.46	.44	.29
FR2	.83	.32	.40	.42	.42
FR3	.77	.39	.57	.50	.33
FR4	.86	.55	.38	.48	.46
FS1	.37	.87	.57	.32	.32
FS2	.44	.77	.38	.39	.39
FS3	.48	.79	.42	.55	.34
COMPLX1	.42	.42	.86	.53	.54
COMPLX2	.33	.50	.88	.32	.47
COMPLX3	.32	.48	.81	.39	.41
COMPLX4	.39	.32	.79	.40	.27
COMPT1	.42	.40	.50	.76	.42
COMPT2	.50	.57	.48	.80	.33
COMPT3	.48	.38	.32	.85	.32
OWN1	.40	.42	.54	.27	.88
OWN2	.57	.33	.47	.33	.81
OWN3	.38	.46	.41	.50	.79
OWN4	.57	.32	.27	.41	.80

FR= Firm Resources; FS= Firm Size; COMPLX= Complexity; COMPT= Compatibility; OWN= Owner's role

Table 4 Fornell and Larcker's (1981) Criterion

	FR	FS	COMPLX	COMPT	OWN
FR	.87 ¹				
FS	.62 ²	.82			
COMPLX	.44	.55	.85		
COMPT	.40	.60	.43	.84	
OWN	.52	.53	.42	.59	.87

Note: ¹Square root of AVE (diagonal); ²Off diagonal are Pearson Correlation; FR= Firm Resources; FS= Firm Size; COMPLX= Complexity; COMPT= Compatibility; OWN= Owner's role

In Fornell and Larcker's (1981) compare the square root of each construct's average variance extracted (AVE) with its bi-variate correlation with all opponent construct. To confirm the Discriminant validity, the square root value of AVE of each construct should be greater than the values of bi-variate correlation exist if the (Ringle et al., 2010). In our case, table 4 shows that AVE for FR (firm resources) is .77 and its square root is .87. This value is greater than FR's bi-variate correlation with all opposing constructs and confirm the discriminant validity for FR construct.

6.1 EVALUATION OF THE STRUCTURAL MODEL

Before hypothesis testing, it is necessary to assess the collinearity issue. According to Hair et al. (2016), one of the major potential issues in structural model is collinearity and they provided that this issue arises when the value of variance inflation factor (VIF) exceeded 5. Therefore, it is necessary that VIF value should be 5 or less, Table 5. The Smart PLS results in Table 6 indicate that all VIF values of predictors are less than 5 which means there is no collinearity issue among all the predictors.

Table 5: Addressing the collinearity issue

Criterion (ICT Adoption Decision)	
Predictor	VIF
FR	1.38
FS	1.31
COMPLX	1.26
COMPT	1.29

Note: FR= Firm Resources, FS= Firm Size, COMPLX= Complexity, COMPT=Compatibility

6.2 TESTING MEDIATION HYPOTHESIS

Table 7 indicates the results of the estimated structural model from PLS-SEM analysis. Muller et al. (2005) suggested that a variable function as a mediator when it fulfills four conditions. The first condition is that in the absence of a potential mediator the relationship between independent and dependent variable must be significant. The second condition is that the predictors (FR, FS, COMPLX, COMPT) must significantly impact the mediator (OWN). The third condition is that controlling for the effect of the predictor (FR, FS, COMPLX, COMPT), the mediator (OWN) must significantly influence the outcome variable (AD). Table 6 shows that our mediation model meets the above three conditions. Direct effect without mediator is significant as Table 7 shows ($\beta = .47$, $t = 8.35$, $p < .01$). In addition, the indirect effect through the mediating variable (the entire path from FR, FS, COMPLX, COMPT to AD) must be significant after including a mediator in PLS path model. The bootstrapping of indirect path in SmartPls provided results about indirect effect (Table 7), and we found it significant ($\beta = .18$, $t = 4.90$, $p < .01$).

The fourth condition is that the previously significant path coefficient between the independent and dependent variables (FR, FS, COMPLX, COMPT to AD) must significantly change its value (magnitude) in the presence of the mediator. Table 7 indicates that, by including the mediator in the model, the value of the path coefficient was reduced significantly, from .47 to .28. However, the significant relationship between predictors and criterion in model A (t -value = 4.90) remained significant in the presence of a mediator in model B (t -value: 4.61). The significance of FR, FS, COMPLX, COMPT and AD relationship in both models, but a considerable reduction in the magnitude of path coefficient for this relationship in model B suggests partial mediation (Baron & Kenny, 1986; Muller et al., 2005).

In addition to this, the variance accounted for (VAF) was calculated to assess the strength of the

mediation effect. Hair et al. (2016) suggested the calculation of VAF instead of applying a commonly used Sobel test because the distributional assumptions of the Sobel test do not hold for indirect effect and lack statistical power. VAF determines the size of the indirect effect (.18) in relation to the total effect (direct effect + indirect effect, which is $.47 + .28 = .75$): $VAF = .28/.75 = .37$. VAF between .20 and .80 indicates partial mediation (Hair et al., 2016), which is the case in our model.

Table 6: PLS regression result for mediation model

Direct Effect: Adoption Decision (Criterion)		
Predictors	β	t-values
FR,FS, COMPLX, COMPT	.47	8.35
Indirect Effect		
Indirect Path	β	t-values
FR,FS, COMPLX, COMPT \rightarrow Own \rightarrow AD	.28	4.90

Note: FR= Firm Resources, FS= Firm Size, COMPLX= Complexity, COMPT=Compatibility

7. DISCUSSION

SMEs are vulnerable to adopt information and communication technologies due to lack of firm resources, insufficient capital, complexity and compatibility of the new technologies and other reasons. This study was intended to identify the factors that persuaded the Pakistani SMEs to adopt ICT using the organizational and technological context of T-O-E framework taking the owner/manager's role as mediator. The results of this study indicate that our model meets all the requirements suggested by Baron and Kenny (1986) Muller et al. (2005). This study found a significant direct effect ($\beta = .47$, T-values= 8.35) between independent and dependent variables without a mediator (Model A). The relation remains significant after inclusion of mediator however the value of path coefficient was reduced significantly, from .47 to .28. According to Hair et al. (2016), the variance accounted for (VAF) was used to calculate the strength of mediation which indicates the partial mediation (VAF= .39) among independent and dependent variables.

8. CONCLUSION

From the study, the owner/manager's role is partially mediate between firm resources, firm size, complexity, compatibility, and adoption decision of ICT among Pakistani SMEs. Findings of the study show that firm resources, firm size, complexity, compatibility are the key factors that persuade the Pakistani SMEs to adopt new ICTs so that they can compete and survive in a complex and ever-changing business environment.

9. DATA AVAILABILITY STATEMENT

The used or generated data and the result of this study are available upon request to the corresponding author.

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