

THE INFLUENCE OF KNOWLEDGE MANAGEMENT ON E-BUSINESS ADOPTION IN SAUDI SMES

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ABSTRACT

Due to lack of research on SMEs in Saudi Arabia in general and in Knowledge management field in specific, this research contributes to both knowledge management and e-business literature. It further empirically validate the model of e-business adoption taking into consideration the influence that knowledge management has. The main purpose of this research is to evaluate knowledge management influence on e-business adoption among Saudi Arabian SMEs in their supply chain management. The study utilized quantitative approach to collect and analyse data. Questionnaires were prepared and distributed to 128 SMEs operating within the Saudi Arabian country. The results of the current study showed that knowledge acquisition is the only knowledge management process that significantly influencing the adoption of e-business among the SMEs in Saudi Arabia. Both knowledge dissemination and knowledge application were found to have no significant effect on the adoption of e-business. Management practices for both the SMEs should put many efforts to ensure that knowledge management enhancement especially when organisations want to adopt e-business.

Keywords: E-business, knowledge management, adoption, SMEs, Saudi Arabia

INTRODUCTION

Small and Medium-sized Enterprises (SMEs) offer a great platform for economic progress through creation of job opportunities in developing countries such as Saudi Arabia. However, many SMEs may perform poorly due to lack of information and the right form of technology especially in the supply chains (Love & Roper, 2015). Moreover, SMEs in developing countries have not fully embraced the integration of e-business in their supply chain management process (Najjar, Shahwan & Yasin, 2017). Innovation is an indispensable factor for development of SMEs. However, innovation is possible if knowledge is adequately managed (Rodríguez & Nieto, 2016). Therefore, the top management in any organization should facilitate better knowledge management in the organizations. The sorting out, sharing and application of the knowledge among organizations should occur in the most effective way to assist SMEs (Subrahmanya, 2015). The world has moved from traditional business practices to a knowledge-based economy where business owners or operators have realised the essence of knowledge as a major impetus towards the success of business practices (Scuotto, Giudice & Carayannis, 2017; Gunawan, Jacob & Duysters, 2016). One of the area that can be improved and influenced by knowledge management is e-business practices and activities. More specifically, in supply chain, E-business requires proper and enhanced knowledge management to ensure that they meet the needs of the modern businesses due to the connectivity with external partners. To overcome the challenges that are associated with the adoption of e-business in the supply chain management, SMEs is required to careful manage their knowledge in terms of better knowledge acquisition, sharing and application, from both internal and external sources (Rahayu & Day, 2015).

Knowledge management has been known to be one of the major concerns in all kinds of organisations because of the importance that knowledge has been given for survival and prosperity of the various organisations (Keeble & Wilkinson, 2017). Durst and Edvardson (2012) state that knowledge management should form one of the main daily activities of the SMEs to facilitate their success. Marra, Ho and Edwards (2012) held the idea that the incorporation of knowledge management in SMEs is considered as an imperative factor for augmenting its long term success. A research study conducted by Gholani, Asli, Nazari-Shirkouhi and Noruzy (2013) found out that there is a significant relationship between knowledge management and the performance of businesses. However, with

customer demand changing everyday due to dynamism present within the society today, e-businesses need to focus on an in-depth perspective and scrutinize the possible facets of knowledge management that are relevant towards enhancing the success of e-business adoption for SMEs (Subrahmanya, 2015).

The implementation of e-business within the supply chain of businesses in developed countries has created a paradigm shift in the way people carry out their businesses. In developing countries, for instance, Saudi Arabia, few SMEs have managed to evaluate and incorporate e-business in their supply chain management as an effective resource management tool (Alkhoraif, A., & McLaughlin, 2018). Although SMEs have been an important part of the economic development in the developing countries, there is not much that has been done to improve their productivity in Saudi Arabia's economy (Albliwi, Antony, Arshed & Ghadge, 2017). To effectively compete in the global economy, SMEs within Saudi Arabia need to integrate e-businesses within their supply chain to enhance their support for the country's economy. To integrate the e-business in the supply chain, business owners need to consider knowledge management processes, as Attia and Salama (2018) stated that knowledge management could assist the business to implement various technologies within the supply chain management.

Thus, this research is an attempt to investigate the influence of knowledge management processes on e-business adoption in Saudi SMEs. The research papers started by reviewing the literature on knowledge management, e-business and SMEs in developing countries. Then, the research methodology and how the research instrument was developed were discussed. The data collection and analysis were presented followed by a discussion section.

LITERATURE REVIEW

Concept of Knowledge Management

Organizations have different kinds of resources they need to utilize properly. Knowledge is a crucial resource that needs to be created, organized and disseminated to cause success in organizations. Rodríguez & Nieto (2016) identifies two important types of knowledge: explicit and tacit.

Organisations should always strive to ensure that they utilize knowledge in order to reap great benefits (Grover & Froese, 2016). The findings of Martín-de Castro (2015) reveal that knowledge management creates a dynamic capability that assists companies to have a competitive advantage over their rival companies especially in the high-tech modern world. Knowledge management helps organizations to overcome the prevalent barriers that are inherent in businesses' supply chain (Patil & Kant, 2014). A study by Yee-Loong Chong, Ooi, Bao & Lin (2014) discuss the Knowledge management in three main processes; knowledge acquisition, knowledge dissemination and knowledge application. For the developing businesses, knowledge management acts as an effective springboard over which innovation is based upon (Donate & de Pablo, 2015).

Knowledge Management and E-Business Adoption in SMEs Supply Chain

SMEs contribute towards almost 28% of the total economic activities in addition to creating employment opportunities to around 40% of the entire working population in Saudi Arabia. As globalization intensifies, many SMEs within the country have no choice apart from adopting the up-to-date technology that can assist them to keep up with the endless competition present within the community (Hertog, 2010). A lot of people expect the businesses to create a favourable environment that reflect the present state of technology. In response to this expectation, SME businesses have increased their intensity to offer their services and businesses in a more innovative way contrary to the traditional mechanisms (Wright, Roper, Hart & Carter, 2015).

E-business activities within Saudi Arabia have been assessed by various researches. Alhejji, Garavan & Carbery (2018) state that the growth of the need to protect consumers in the society in all businesses facilitated the development and embracement of the idea of e-business. Saudi Arabia is one of the countries that pride itself for high level of technology (Makki & Chang, 2015). The marked increased in the use of the social media, and the online features have created a springboard for businesses to adopt the use of e-business practices (Magd, 2014). The previous research mostly have dealt with the reasons why e-business is important for an organisation. It does not explain in details the relationship between knowledge management and e-business adoption.

Azam (2015) notes that before businesses in Saudi Arabia start to use the e-banking services they engage in an in-depth analysis and evaluation of the external and internal factors. Ansari & Qadri, (2018) state that factors such as trust, efficiency in technology, quality of network systems, social influences, among others are some of the major factors that affect the adoption of e-business activities. The quality of the interfaces of e-businesses platforms such as websites in addition to the presence of adequate information forms one of the greatest concerns of consumers when they want to use such e-business systems (Bahaddad, Drew, Houghton, & Alfarraj, 2015). The SMEs embrace and apply e-business practices in their operations at slow rates because of the lack of proper awareness and how the technology system would impact these businesses (Altayyar, & Beaumont-Kerridge, 2016).

According to Wright, Roper, Hart, & Carter (2015), SMEs in the developing countries lack the necessary resources and knowledge base that can be utilized strategically to implement, amend as well as exploit the e-business systems. Additionally, a study carried out by Andersen (2013) showed that for business enterprises to succeed in the present society, they need to augment better management practices with innovation in knowledge management. Leal-Rodríguez, Roldán, Leal & Ortega-Gutiérrez (2013) note that knowledge-based theory supports the idea that when knowledge is sufficiently managed, there is the creation of distinctive capabilities that enhances performance in businesses through innovation. For businesses to perform extraordinarily, they need to effectively manage knowledge to create a platform for innovation (Giaoutzi, Storey & Nijkamp, 2016). Altayyar & Beaumont-Kerridge (2016) divides factors that affect SMEs development into external, organizational and technological factors. Factors related to market forces within Saudi Arabia are some of the greatest determinants of the adoption of e-business in the developing country (Al-Hudhaif & Alkubeyyer, 2011). The research have been able to identify the various impediments to adoption of e-business. This present research will augment the findings from these researches by investigating if knowledge management influences the adoption of e-business in supply chain in SMEs specifically, in Saudi Arabia.

There are various literature that have been carried out with an aim of finding out the pertinent factors that motivate business to adopt e-business practices. Many businesses would tend to offer e-business activities because of desire to amplify competitive advantage over their rivals. According

to Barać, Ratković-Živanović, Despotović-Zrakić, Labus & Bogdanović, (2017), the implementation of e-business activities in businesses is a positive step towards assuring the consumers that their needs have been considered. This enhances the brand image of the organisations and hence, improves the performance of businesses (Zhu, Zhao, Tang & Zhang, 2015). E-business practices have been assessed to improve the quality of services rendered to the consumers. To offer this, businesses need to be equipped with the various types of information that is needed to maintain innovation as consequently, better services that will attract and retain customers (Tsironis, Gotzamani & Mastos, 2017). Different research have been able to identify the advantages of e-business adoption in SMEs such as Yee-Loong Chong, Ooi, Bao & Lin (2014) study which identified knowledge acquisition, sharing and application as the major factors of knowledge management that influence adoption of e-business in Malaysia.

RESEARCH MODEL AND HYPOTHESIS

This research seeks to investigate the extent to which knowledge management influences the adoption of e-business in Saudi Arabia. Knowledge management is assumed one of the factors that influence the SMEs to embrace and implement the e-businesses (Patil & Kant, 2014). Yee-Loong, Ooi, Bao & Lin (2014) carried out a research in Malaysian SMEs that utilized three facets of knowledge management: Knowledge Acquisition, Knowledge Dissemination and Knowledge Application. The following model, which was adopted by them, will be used for the present research to find out if the factors identified are applicable to Saudi Arabian SMEs.

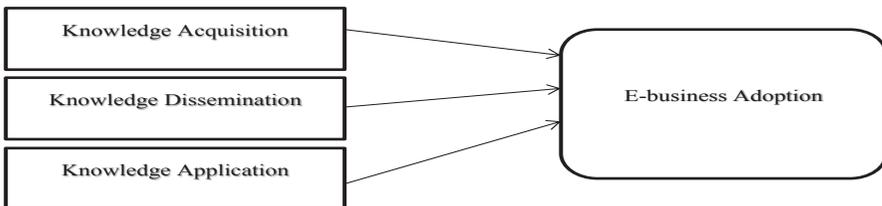


Fig.1. Research Conceptual Model.

Knowledge Acquisition

Knowledge acquisition in organisations takes the form of organisational learning, absorption of knowledge, creative processes, as well as knowledge transformation. Acquisition is the process of creation of knowledge from the individual as the organisational level is integrated (Zhou, Zhang, Sheng, Xie & Bao, 2014). The knowledge may originate from either within the organisation or external sources. External sources of information are richer in new ideas and a holistic view of these ideas needs to be evaluated effectively. The sources of the information can be suppliers, customers, among other external experts. Bareiss (2014) refers to knowledge acquisition as a process that is used by companies to get information from other experts and develops new information. (Lyles & Salk, 1996) affirms that the acquisition of knowledge for organisations makes them acquire a competitive advantage over their competitors. Any form of development emanating from the innovative ideas comes from the assessment of acquired knowledge (Cassiman & Veugelers, 2006). On the other hand, e-business activities can be used by companies to enhance the operations and ensure that firms know the best options that are available to make their activities efficient. The whole idea about the e-business does not only entail the technological perspectives but also includes the acquisition of knowledge (Lin & Lee, 2005). However, the present research would like to expand on this body of information and find out if knowledge acquisition is related to e-business adoption in supply chains among the SMEs.

As a result, the following hypothesis can be stated:

H1: Knowledge acquisition positively influences e-business adoption in the SMEs supply chain.

Knowledge Dissemination

Knowledge dissemination refers to the process whereby the available information is shared among persons to bring new ideas or concepts that can drive changes and innovation within the business entity (Du Plessis, 2007). This is distribution of knowledge to people who may require or need it. Dissemination of knowledge has to be done within the specific business to aid the accomplishment of the intended objectives (Swan, Newell,

Scarborough, & Hislop, 1999). Most businesses fail because there lacks good communication to enhance the flow of information. Carneiro (2000) asserts that sharing of knowledge facilitates firms to perform better and increase their competitive advantage over others. Darroch & McNaughton (2002) scrutinized the link between knowledge management and the level of innovation and found a positive correlation between the two factors. Therefore, it is important to incorporate knowledge dissemination in the supply chain of SMEs businesses. Therefore, it can be hypothesized that:

H2: Knowledge dissemination positively influences e-business adoption in the SMEs supply chain.

Knowledge Application

Chen & Huang (2009) explains that knowledge application can be defined as the process of using knowledge so that it can benefit firms. Business use the knowledge acquired to make processes more effective or productive. Sarin & McDermott (2003) states that the firms that have been able to continuously put into practice the knowledge that they have acquired, reap maximum benefits especially in the area of technology. The results of this research are consistent with the findings of Fritsch & Kauffeld-Monz (2010), who established that employees who are more used to applying acquired knowledge in organizations tend to become more creative and innovative especially when handling technology such as e-business. Application of knowledge gives rise to new knowledge (Almeida & Phene, 2004). To establish further the impacts of knowledge application in e-business, the following hypothesis can be articulated:

H3: Knowledge application positively influences e-business adoption in the SMEs supply chain.

METHODOLOGY

The present study sought to test the hypotheses that have been developed. To do this, a survey was developed. There were 29 items in the survey questionnaire and were used to measure four factors; e-business adoption, knowledge acquisition, knowledge dissemination and knowledge application. The survey was adopted from the study of Yee-Loong, Ooi,

Bao & Lin, (2014). It was restructured to fit the needs of the present study.

Data Collection and Sampling

The study targeted the SME businesses present within Saudi Arabia. The contact details (emails) of SMEs were obtained via Chamber of commerce, and then the URL of online survey was sent out to 800 SMEs. Yee-Loong et al. (2014), proposed that a sample size (N) is supposed to be greater than $50 + 8P$, where the value of P is the number of independent variables for a sample to qualify for regression analysis. In addition, N should be greater than $104 + P$ for every independent variable so that we can affirm that they are satisfactory to perform regression analysis for this kind of a study. There are three independent variables in this study (knowledge acquisition, knowledge dissemination and knowledge application). To meet the minimum sample to satisfy the rule of thumb, at least $50 + (8 * 3)$ sample would be required.

Therefore, at least a sample of 74 would be appropriate for the present study. The present study chose a sample of 128 SME as the sample. The top management levels were well equipped to answer the questionnaire because they have a lot of information than the other employees. Targeting the top management will ensure a higher reliability level for the information or the data collected.

Variable Measurements

The independent variables that were utilised in the present study were adopted from the study carried out by Yee-Loong, Ooi, Bao & Lin, (2014) as mentioned above. There were five number of items for knowledge acquisition, five for knowledge dissemination and six for knowledge application; giving a total of 16 items for the independent variables. These were the here aspects used to measure the knowledge management. The choices of every item for each of the three concepts ranged from 1 “Strongly Disagree”, 2 “Disagree”, 3 “Neutral”, 4 “Agree” and, 5 “Strongly Agree”.

The dependent variable for the study was e-business tools adoption. There were a total of 13 items that were used with the dependent variable. This was used to capture the e-business adoption among the Saudi Arabian SMEs. Responses for every question ranged from 1 “Never”, 2 “Seldom”, 3 “Neutral”, 4 “Often” and “5 “Always”.

DATA ANALYSIS

Responses from total of 128 SMEs were fruitfully collected. The analysis was done using SPSS data analysis and presented in form of Table 1 as shown below. According to the table above, 21.7% work in the service industries, 10.9 % in the retail, 20.2% in the manufacturing industry, 11.6% in the construction, 11.6% in real estate, those in the petrochemicals are 2.3% while others are 20.9%. Therefore majority of the SMEs who participated in the study come from the service industries. The persons interviewed were asked to name which job role they played in their organizations. Those who stated that they were CEO’s were 19.4%, those who said were in the finance were 13.2%, those in the training were 3.9%, those who were HR were 8.5%, those in the planning were 10.1%, those in the production were 4.7%, IT 10.1%, Marketing 2.3%, and others were 27.1%. Five companies were found to be in operation for less than one year, 33 were in operation between 2-4 years, 9 were in operation between 4-10 years, and those that had operated for more than 10 years were 80. Organisations that had less than 10 employees were 32, those that had between 10-20 employees were 20, those who had 21-50 employees were 8 while those that had 50-200 employees were 68.

Table 1: Analysis of Participants Demographic Data of Organisations

	Variables	Frequency	Percentage
Sector	Service	28	21.9
	Retail	14	10.9
		26	20.3
		15	11.7
	Real Estate	15	11.7
	Others	27	21.1
		3	2.3

	Variables	Frequency	Percentage
Participants Job Role	CEO	25	19.5
	Training	5	3.9
	Finance	17	13.3
	HR	11	8.6
	Planning	13	10.2
	Production	6	4.7
	IT	13	10.2
	Marketing	3	2.3
	Others	35	27.3
	Organization Age	Less than 1 Year	5
2-4 Years		33	25.6
4-10 Years		9	7.0
More than 10 Years		80	62.0
4-10 years		1	.8
No. of Employees	Less than 10	32	25.0
	10-20	20	15.6
	21-50	8	6.3
	50-200	68	53.1

Normality Test

A normality test is essential to check whether the data is normally distributed before performing the regression analysis. Because of the nature of the data, KMO test was carried out. The test was to determine if the data was favourable for factor analysis to be carried out. The test measures the sampling acceptability. Tests of between 0.8 and 1 are adequate. Tests whose value shows less than 6 are not adequate. In this case, the value is 0.825, which is an adequate value to continue with factor analysis.

Table 2: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.825
Bartlett's Test of Sphericity	Approx. Chi-Square	2811.818
	Df	378
	Sig.	.000

Scale Reliability and Factor Analysis

The data was tested to check if it meets the expected level of reliability. Cronbach's alpha (α) coefficient was used to determine the reliability level. A coefficient value of between 0.70 and 0.90 is better for the present analysis. Therefore, the current research will use a minimum alpha coefficient value of 0.70 to determine if some variables will be deleted or not. The analysis for the Cronbach's alpha is as shown below.

The data represented in this study are superfluous and need to be reduced to single factors for each of the constructs. To determine the validity of the current variables, a factor analysis was performed. Exploratory factor analysis is applicable due to the fact that survey questions were used. To test the validity, a minimum factor loading of 0.4 was chosen (Raubenheimer (2004)).

Table 3: Factor Analysis and Scale Reliability

Variable	Item	Factor loading	Reliability	% of Variance	Eigenvalues
Knowledge Acquisition	Our organization has processes for acquiring supplier knowledge.	0.787	0.366	38.913	5.837
	Our organization has processes for generating new knowledge based on existing knowledge.	0.701			
	Our organization has processes for acquiring customer knowledge.	0.843			
	Our organization has processes for acquiring knowledge on developing new products/services.	0.663			
	E-business supply chain technology implementation can assist our organization in better capture the business operation processes and trading partners' abilities.	0.685			
Knowledge Dissemination	Our organization has processes for distributing knowledge throughout the organization.	0.641	0.900	21.421	3.213
	Our organization has processes for transferring organizational knowledge to employees.	0.824			
	Our organization has processes for distributing knowledge among our business partners.	0.852			
	With e-business supply chain technology, documents and records can be shared easily throughout the organization.	0.733			
	We would consider the implementation of e-business supply chain technology as it allows information to be shared across different locations.	0.752			

Variable	Item	Factor loading	Reliability	% of Variance	Eigenvalues
Knowledge Application	Our organization has processes for integrating different sources and types of knowledge.		0.095	8.552	1.283
	Our organization has processes for transferring organizational knowledge to employees.				
	Our organization has processes for filtering knowledge.				
	Our organization has processes for applying experiential knowledge.				
	Our organization has processes for applying knowledge to solve new problems.				

Multiple Regression Analysis

To test the hypotheses for this study, multiple regressions were applied. Table 4 below shows the results of the multiple regression analysis. Durbin-Watson test was used to test autocorrelation. The range of the value of the test is supposed to fall between 1.5 to 2.5. The analysis found the value to be 2.263, which is within the range of the given values. Therefore, the data does not have a problem of autocorrelation. When the multicollinearity problem was assessed, it was found out that none of the variables had VIF value greater than 10 and none had a tolerance value less than 0.1. Therefore, there is no problem of multicollinearity.

Table 4: Multiple Regressions Analysis

Predictor variable	Beta	t-value	Sig.	Tolerance	VIF
Knowledge Acquisition	0.562	7.566	0.000	0.977	1.023
Knowledge Dissemination	-0.025	-0.260	0.795	0.605	1.653
Knowledge Application	-0.087	-0.914	0.362	0.602	1.662

Overall model F= 19.108;
 p<0.01; R2 =0.314; adjusted R2 =0.298; Durbin-Watson test = 2.263

From Table 4, the F value = 19.108 is significant (where P-value is less than 0.05); which means that there is a positive relationship between knowledge management and e-business adoption among the SMEs in Saudi Arabia. The results are statistically significant. The R² value, 0.314, means that knowledge management accounts for 31.4% of the variation in the e-business adoption among the SMEs in Saudi Arabia.

The results also prove that only Knowledge acquisition ($P < 0.01$) variable is a statistically significant facet for adoption of e-business among the SMEs operating in Saudi Arabia. Contrary, Knowledge dissemination ($P > 0.05$) and knowledge application ($P > 0.05$) do not have any important effect on the adoption of e-business among the SMEs within Saudi Arabia. Consequently, hypotheses, H1 are supported while H2 and H3 are rejected from the analysis of this study.

DISCUSSION

According to the present research, knowledge acquisition is the most important aspect of knowledge management that influences the adoption of e-business among the SMEs in Saudi Arabia. This is in line with the research conducted by Yee-Loong Chong, Ooi, Bao, & Lin (2014) regarding knowledge management and e-business adoption in Malaysia. This could be explained by SMEs being keen to acquire external knowledge (from suppliers) to obtain competitive advantage. Because of the improved technology, competition, and globalization processes, business entities must seek to ensure that they gain the relevant knowledge required to attain the desired goals competitively. Sustainability of the organizations in the modern society will require them to get information and data that will support them to install the required technology to create a favorable competitive advantage over others (Khorsheed, 2015).

In line with the findings of Yee-Loong Chong, Ooi, Bao, & Lin (2014), knowledge dissemination has been found by the present research to have no significant effects on the adoption of e-business within Saudi Arabia. In most cases, businesses may fail to share pertinent information for fear that the competitors will use the information to their advantage. Many businesses feel that the more information is shared or exchanged, the more success will be achieved (Elaimi & Persaud, 2014). What one person does not know may be known by the other business people. Some of the persons

may refuse to share information even if they do not use it for fear that they may be victimized for assisting competitors.

The present study found that knowledge application was not a significant factor in influencing the adoption of e-business in Saudi Arabia. This is contrary to the findings of the study conducted on SMEs in Malaysia by Yee-Loong Chong, Ooi, Bao, & Lin (2014). The research found out that many organizations usually seek to share information to other businesses and people and likewise expect to get information or knowledge from other companies or businesses so that they can utilize it and achieve their desired goals. Information acquired by a business can only be useful when actualized. However, the present study contradicts this view (AlShathry, 2016). To a great extent, the Saudi Arabian SMEs and other businesses could be reluctant to apply knowledge obtained from other places for fear of the possible risks. Sometimes, businesses may not be aware of the consequences that would befall the businesses when new ideas. In addition, some of the business owners may be reluctant to allow employees to create and apply new ideas.

CONCLUSION

The present study sought to investigate the possible influences of knowledge management on the adoption of e-business among the SMEs operating within Saudi Arabia. The results of the study have showed that only knowledge acquisition significantly influences e-business adoption among the enterprises in the country.

There have been many studies that have been carried out regarding knowledge management and the adoption of e-business among various businesses. Most of the research concentrated on the physical aspects such as the visible technology as well as the presence of assets and other kind of resources as the possible influence towards the adoption of e-businesses. Many studies have focussed less on the implications of globalization and the advancement in technology among the developing countries on e-business adoption. This study has been able to add to this existing knowledge and found out that only one of the three knowledge processes; knowledge acquisition influences e-business adoption among the SMEs that operate within Saudi Arabia. Furthermore, the study has also been able to unearth the fact that abstract or non-tangible assets such as knowledge can be very

imperative in businesses development.

Top management for every company plays a great role in influencing the businesses to integrate relevant factors that would support business progress. Elaimi & Persaud (2014) finds out that as a developing country, businesses within Saudi Arabia should move with speed and adopt the technologies such as web 2.0 and ensure that the organization is fully equipped with possible knowledge networks. Accepting new ideas for the business is a sign of strength and a positive attitude towards growth of businesses. However, many businesses may find that knowledge is not readily available. The management team should always invest in ideas and information because it creates a vital springboard for innovation in business undertakings.

However, there are few limitations this study suffers of. The model for the present research was limited to factors of knowledge management and excluded other significant variables such as the perception of the people regarding knowledge in businesses. The study only used the SMEs. However, future studies can be conducted on other diversified businesses apart from the Small and Medium Enterprises. The findings of the research need to be tested with other countries or societies to check if they can be replicated.

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