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How Does Knowledge Management Drive Competitiveness in Egyptian Software Companies?

Ghada El-Kot
Arab Academy for Science, Technology and Maritime Transport, Egypt & Plymouth Business School, University of Plymouth, UK
E-mail: Ghada.elkot@plymouth.ac.uk

Dalia Gamal
Technology Innovation and Entrepreneurship Center, Egypt

Abstract

Purpose: To investigate the relationship between knowledge management, organizational innovativeness and organization competitiveness in an Egyptian context

Design/methodology: Data were collected from 94 Egyptian software companies. using anonymously completed questionnaires. Data were analyzed using correlation analysis and structure equation modeling

Findings: Organizational innovativeness was a perfect mediator between knowledge management and sustainable competitive advantage.

Research limitation: Using cross sectional data. The sample was relatively small and overrepresented by small and medium sized organizations. The study was conducted in specific context which is Egypt software industry.

Originality / value: Investigates the Resource Based View of knowledge management in the Egyptian software industry. It provided an empirical explanation of the mechanisms through which the knowledge management affects organization competitiveness.

Practical implication: The paper provides managers with evidence of the importance of knowledge management for organizational competitiveness. The paper gives also support for the role of organization innovativeness as a mediator to achieve KM performance outcome. The research viewed the concept of innovativeness as multidimensional, providing mangers with insight about many sources of innovativeness other than the technical innovation that prevail the extant literature.

Keywords: knowledge Management; innovativeness; sustainable competitive advantage; process capability, Software, mediation, Egypt.

Introduction

The field of strategic management focuses on understanding sources of sustainable competitive advantages (SCA) in organizations (Barney, 2001; Priem & Butler, 2001). Based on Resource-Based Theory (Penrose, 1959; Wernerfelt, 1984; Barney, 1991; and Peteraf, 1993), generating and sustaining competitive advantages (CAs) resides in the set of strategic resources and capabilities available to the firm. Knowledge and knowledge management (KM) resources are particularly significant and arguably the most important among these (Drucker, 1993; Spender, 1996; Grant, 1996b; Nahapiet and Ghoshal, 1998; and Liao, 2009) and considered a main source of CA (Connor and Prahalad, 1996; Grant, 1996a; Alavi and Leidner, 2001; Zhao *et al.,* 2003; Halawi *et al.,* 2005; Wong and Aspinwall (2006); and Ho, 2009). Although KM has been frequently cited as a prime source of organization competitiveness, analyses to date have been mostly conceptual (Choi and Lee, 2003; and Chuang, 2004), and only a limited number of studies have explored empirically the resource based view (RBV) of KM. Moreover, the mechanism through which this is achieved remains an area for investigation.

As we are living under a hyper competition environment; firms need to resort to continual innovation if they would like to obtain a CA (Liu *et al.,* 2001; Lemon and Sahota, 2004; and Cooper *et al.,* 2008), and an increasing attention should be given to innovation as a key success factor in a firm's SCA (Damnpour (1989); Damnpour (1991); Doyle (1998); Quinn (2000); Lee *et al.* (2005); Darroch (2005); Kleef, and Roome (2007); Plessis *et al.* (2007); Alegre and Chiva (2008); Liao (2008); and Rhee *et al.* (2009)). Effective KM was found to be an antecedent of innovation in some studies (Nonaka and Takeuchi, 1995; Dove, 1999; Carneiro, 2000; Darroch, 2005; and Liao and Wu, 2009). The KM competency is critical to successful innovation as innovation process is knowledge intensive (Gloet and Terziovski, 2004; and Gordon *et al.*, 2007; Maqsood and Finegan, 2009).

However, it is difficult to draw conclusions from the extant literature about the relationship between effective KM and innovation because there is a dearth of empirical research that investigated relationships between the two constructs (Gloet and Terziovski, 2004; Darroch, 2005; and Hall *et al.*, 2006). Besides; some of this literature takes a unidimentsional view of innovation which is ''technical innovation'' (e.g. Gerwin and Barrowman 2002; Gonzalez, 2007; and Liao *et al.*, 2008) with relatively fewer studies conducted on organizational innovation based on the viewpoint of the organization as a whole (Weerawardena, 2003; and Dobni, 2008). Therefore, inconsistency in findings were found (Dobni, 2008). His study aims to (1) provide an empirical investigation for RBV of KM in Egyptian software companies, and (2) provide an explanation of how would this occur through organizational innovativeness (OI).

Previous studies

There is a general agreement that KM represents an important CA factor for organizations (Quinn, 1992 Drucker, 1993; Hall, 1993; Alavi and Leidner, 2001; Connor and Prahalad, 1996;

Grant, 1996b; Zhao *et al.,* 2003; Angelo *et al.,* 2003; Halawi *et al.,* 2005;and Ho, 2009), and that SCA in the 21st century will be accomplished through KM (Johannessen *et al.,* 1999; Grant 1996b; Nahapiet and Ghoshal, 1998; Johannessen and Olsen, 2003; and Halawi *et al.,* 2005). However, Halawi *et al.* (2005); and Chuang (2004) note that while the notion that KM might be able to create SCA for firms is provocative, working in this area is relatively underdeveloped, both empirically and theoretically. Chuang (2004) contended the research on KM and CA has emphasized 'description rather than empirical study' but that KM can lead to such an advantage. Choi and Lee (2003) in their attempt to provide an integrated view of KM that links KM enablers, process and organization performance, asserted that in spite of considerable discussion of KM processes and organizational performance, there is no clear link between them. They argued that to establish the relationship between them, an intermediate measure such as specific process, innovation, or organizational creativity must be considered. This was also observed by Davenport and Prusak (1998) who pointed out that although the relationship between KM and performance indicators has been discussed at length, few firms have been able to establish a causal relationship between KM activities and firm performance. They related KM activities with some intermediated activities that affect performance results such as capacity of employees to carry out tasks related to knowledge, the generation of ideas, and innovation. Gold *et al.* (2001) suggested OI is an intermediate outcome of effective KM. Similarly, Li *et al.* (2006), in their study of investigation the impact of organizational capability on firm performance, concluded that organizational capability do not necessarily have significant direct effect on firm performance, but they must be mediated by other actor constructs such as OI. Wiig (1997); Gold, *et al.* (2001); Choi and (2003); Kalling (2003); Darroch, (2005); and Jantunen (2005) asserted that there are a very few empirical studies on organizational performance in KM, because knowledge is intangible and difficult to measure.

On the other hand, an organization's ability to innovate is recognized as one of the determinaingfactors for it to survive and succeed and that being innovative leads to CA (e.g. Tushman *et al.,* 1986; Damnpour 1989; Porter, 1990; Doyle, 1998; Damnpour, 1991; Deshapande *et al.,* 1993; Smith *et al.,* 2000 ; Quinn, 2000; Lee *et al.,* 2005; Darroch, 2005; Alegre and Plessis *et al.,* 2007; Chiva, 2008; Liao, 2008; Cooper *et al.,* 2008; Armbruster, 2008; Liao, 2008; and Gupta, 2009 and Rhee *et al.,* 2009) (e.g. Deshapande *et al.,* 1993; and Smith *et al.,* 2000). Moreover OI is sometimes seen as synonymous with CA (Tushman *et al.,* 1997; Roberts, 1998; and Byrd and Turner, 2001).

Through innovation, organizations diversify and adapt, and even rejuvenate or ''reinvent'' to fit the changing conditions of the technology and the market (Nonaka and Yamanouchi, 1989). Additionally, scholars have stated that innovation is a mechanism by which organizations can draw upon core competencies and transition these into performance outcomes critical for success (Reed and DeFillippi 1991; Barney 1991; Damanpour, 1991; Hurley and Hult, 1998; 2004; Cooper, 2000; and Gonzalez *et al.,* 2007). Organizational innovation is emphasized in the literature as one of the possible consequences of effective KM. (e.g. Nonaka and Takeuchi (1995); Antonelli (1999); Dove (1999); and Carneiro, (2000). Chuang (2004) stated "viewed from the resource based perspective, the KM resource provides the resources that make innovation feasible and enable continuous improvement of products". Gupta (2009) indicated literature

provides a very strong link respecting the relationship between innovativeness and KM. Smith et al (2000) asserted that SCA results from innovation. Innovation in turn results from the creation of new knowledge. He also mentioned that the major goal of KM is to enhance innovation. In the same direction, the results found by Liao and Chuang (2006) confirmed the vital role which KM has for the knowledge processing capability and in turn, on speed and activity of innovation. Gordon *et al.* (2007) explained that firms with a KM competency can capture knowledge and related information and make them accessible to knowledge workers and innovators. Lee et al (2008) explicated by establishing excellent KM systems, it is possible for firms to make effective use of its own resources so that they can accumulate business management experience and reach their goals for organizational innovation. Ellonen *et al.* (2009) confirmed the firm's ability to combine and effectively use different types of knowledge is crucial to its success in innovation activities and performance.

However, while many studies have reported aspects of KM as antecedents of innovation and emphasized that effective KM has been presented in the literature as one method for improving innovation and performance, none has explicitly examined the relationship between the two constructs (Darroch *et al.* 2002; 2003; and Darroch, 2005). This is also asserted by Hall *et al.* (2006) who indicated that although importance of KM and its relationship to innovation is widely acknowledged, empirical work, is still in its infancy and characterized by heterogeneous measurement approaches. These empirical studies show mixed results as well (Cantener, *et al.*, 2009).

For example, empirical studies by Darroch *et al.* (2002; 2003) and Darroch (2005) have focused on investigating the relationship between KM processes and different types of product innovation. These studies revealed that some KM processes will positively affect product innovation. Whereas Darroch *et al.* (2005) confirmed the positive role of knowledge dissemination on innovation success, Darroch (2002) did not find any significant effects. Also Wang *et al.* (2006) in their study for enhancing the firm's innovation capability through KM applied for high technology firms; found that innovation capability of high technology firms is significantly related to knowledge acquisition. They concluded also that innovation capability has been shown to positively contribute to long term corporate growth i.e. sustainable competitive advantage. The acquisition of relevant knowledge is considered an effective efficient and necessary means of achieving successful innovation.

However, much of the literature to date evidences a uni-dimensional view of innovation (Subramanian *et al.*, 1996; Weerawardena, 2003; and Dobni, 2008). The word ''innovation'' is frequently found in the literature referred to ''technical innovation'' (e.g. Gerwin and Barrowman 2002; Gonzalez, 2007; and Liao *et al.*, 2008) with relatively fewer studies having been conducted on organizational innovation based on the viewpoint of the organization as a whole, although both technological and non-technological innovations can lead to CA (Weerawardena, 2003; and Dobni, 2008). This restricted view resulting from that bias has been criticized in studies of organizational innovation (Avlonitis, 2001), and this has lead to a lack of consensus on innovation and difficulties in both comparing findings across studies and drawing unbiased conclusions (Dobni, 2008).

From all of the above, the purpose of the presentstudy is to expand the current body of research in this area by empirically investigating the relationships among knowledge management, OI and SCA for Egyptian software companies, by focusing upon multidimensional view of the QI.

Research Methodology

Research Variables

Knowledge Management: definition adopted from Darroch (2003: p. 41); is "The management function that creates or locates knowledge, manage the flow of knowledge within the organization and ensures that the knowledge is used effectively and efficiently for the long-term benefit of organizing", KM processes comprises three components: Knowledge Acquisition, Knowledge Dissemination, and Responsiveness to Knowledge. Knowledge Acquisition (KA): refers to the location, creation or discovery of knowledge. Knowledge Dissemination (KD): refers to the dissemination of knowledge around the organization. Responsiveness to Knowledge (KR): refers to an organization's ability to respond to various types of knowledge. *Organizational Innovativeness* is defined as the organization's overall innovative capability of introducing new products to the market, or opening up new markets, through combining strategic orientation with innovative behavior and processes (Wang and Ahmed, 2004). Five main dimensions determine an organization's innovative capability; Product Innovativeness refers to the novelty and meaningfulness of new products introduced to the market in a timely fashion.

Market Innovativeness: refers to the newness of approaches that companies adopt to enter and exploit their targeted market. Process Innovativeness refers to the introduction of new production methods, new management approaches, and new technology that can be used to improve production. Behavioral Innovativeness refers to sustained behavior change towards innovation, or the overall internal receptivity to new ideas and innovation by individual, teams or management. Strategic Innovativeness refers to organization's ability to manage ambitious organizational objectives, and identify a mismatch of these ambitions and existing resources in order to or leverage limited resources creatively. *Sustainable competitive advantage:* is defined as the extent to which the firm's innovations and distinctive capabilities resist erosion by competitors' efforts (Weerawardena, 2003). SCA construct is conceptualized in terms of three criteria: (a) market advantages gained by the firm, (b) whether it is possible for competitors to duplicate innovations, and (c) whether it is possible for competitors to duplicate distinctive capabilities on which advantages have been founded. Table 1 summarizes the operational definitions of the above three research variables and the corresponding supporting literature.

All research variables are latent variables. KM is represented as a multidimensional construct comprising three KM processes. OI is represented by a multidimensional construct with five dimensions; product innovativeness, market innovativeness, process innovativeness, behavioral innovativeness, and strategic innovativeness (Wang and Ahmed, 2004). Finally, the SCA construct is represented as a multidimensional construct with three dimensions; the relative innovative performance, resistance of innovative capabilities erosion by other competitors and the resistance of internal distinctive capabilities erosion on which advantages have been found.

Research Model

Based on the literature review introduced earlier, innovation leads to the creation of SCA (Deshapande *et al.*, 1993; and Smith *et al.*, 2000; Armbruster, 2008; Liao, 2008; and Gupta, 2009). The major goal of KM is to enhance innovation (Galunic and Rodan, 1998; Liao and Chuang, 2006; and Ellonen *et al.*, 2009). The KM competency is critical to successful innovation because the innovation process is, by its nature, knowledge intensive (Gloet and Terziovski, 2004), therefore, KM can be viewed as a contributor of the creation of SCA through OI. The proposed model is depicted in Figure 1. KM represents an independent variable, SCA represents the dependent variable, and OI; represents an intervening variable (mediating variable).

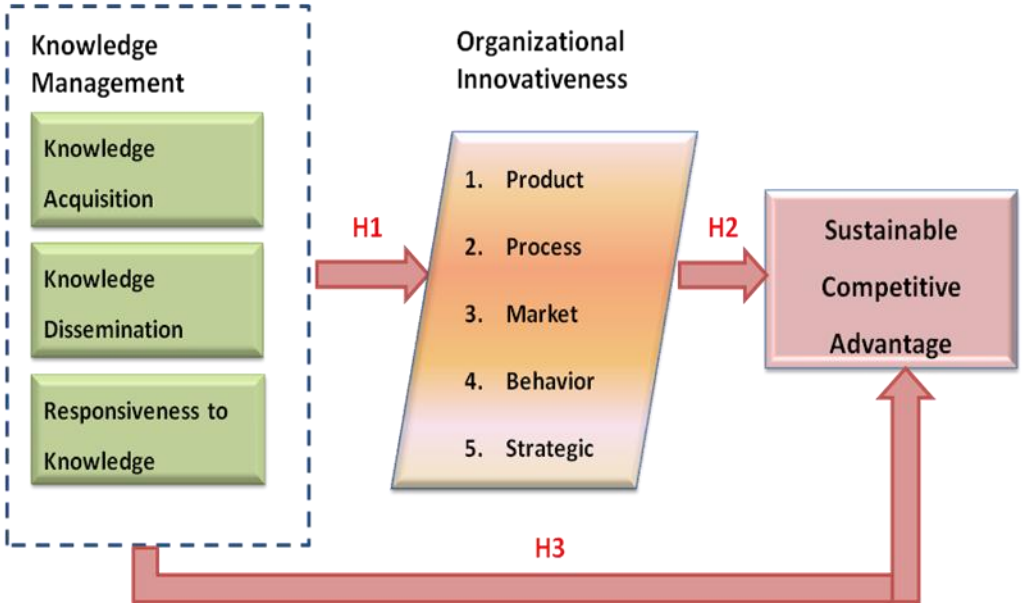

Figure 1 The research model

Research hypotheses

Based on the preceding literature and the above research model, the key argument of the paper is that: an organization SCA depends mostly on organizational innovation (Grant, 1996a; Smith *et al.*, 2000; Liu *et al.*, 2001; Lemon and Sahota, 2004; Lee *et al.*, 2005; Darroch, 2005; Alegre and Plessis *et al.*, 2007; Chiva, 2008; Liao, 2008; Cooper *et al.*, 2008; and Rhee *et al.*, 2009; and Liao *et al.*, 2008). KM is critical for organization innovation capability (Nonaka and Takeuchi, 1995; Dove, 1999; and Carneiro, 2000). Effective KM possible consequences might include: CA (Connor and Prahalad, 1996; and Hall, 1993); and/or innovation (Nonaka and Takeuchi, 1995; Antonelli, 1999; Dove, 1999; Leonard-Barton,1995; Carneiro, 2000; Lee *et al.*, 2008 and Gupta, 2009). From the above, the following relationships could be hypothesized:

H1: There is a positive and significant relationship between KM and OI

H2: There is a positive and significant relationship between Organizational OI and SCA

The mediation effect of organizational innovativeness

Gupta (2009) asserted that the impact of KM systems on performance relates primarily to the organization's ability to innovate -either through improved processes or improved products. Gold (2001) proposed that organization innovation is an intermediate outcome of effective KM. This is also has been asserted by Darroch (2003) whose findings suggested that innovation might be the mediating factor between KM and organization performance based on Han *et al.* (1998) study. KM then could be viewed as creating SCA through OI, therefore, it's hypnotized that:

H3: OI is mediating the relationship between KM and SCA.

Sample and procedure

Software companies - as a knowledge-intensive sector- were selected for this study because knowledge intensive sectors have short product life cycles and high demand for knowledge input (Liao *et al.*, 2007). Also KM is crucial, for knowledge intensive firms that utilize and capitalize knowledge in all their transactions, and that consider KM to be a core capability for achieving CA (Hoo *et al.*, 2009). The study depended on the Official Business Directory of Information Technology Industry Development Agency (ITIDA) to get the required sample. A list of 319 software companies were identified. The sample include organizations with 40 or more employees. Organizations having less than 40 employees were not included because small organizations might not have the same need for KM practices as larger organizations, and that organizations of more than 40 employees would be large enough to presume the incidence of certain KM behaviors and practices (Darroch and McNaughton, 2003; 2005; and Manovas, 2004).

A list of 113 software companies was identified according to the above mentioned criteria. Questionnaires were distributed electronically and/or in person to the CEO or senior management level, assuming that he or she would be in a position to comment on the flow of knowledge around the entire organization rather than the flow of knowledge within one or a few departments. Follow up phone calls were given as reminders to complete the questionnaire. 102 responses were returned. Eight responses from 8 organizations were eliminated from analysis due to incomplete data and, thus 94 responses from 94 organizations were included in the study. The final response rate is 83%. The sample was overrepresented with small and medium size companies (95% of sample comprises company with less than 500 employees). The data were collected between May 2010 to August 2010 and were analyzed using SPSS 16.0 and Amos 16.0

Measures

All research constructs were measured using multi-item scales and based on pre-existing instruments after undertaking a comprehensive review of the literature.. Five measures were employed in this study: Three measures developed by Darroch (2003) for measuring *Knowledge Management capabilities*ly completed questionnairers.

Results

Table 2 displays the results of the correlation analysis among the summed scores for the research variables; knowledge management, OI, and SCA. The following relationships existed between the research variables: The relationship between KM and OI indicated that businesses with more KM showed higher capability in enhancing organizational innovation. The relationship between OI and SCA, indicated that businesses with higher innovation capability showed higher capability of producing SCA.Finally, the relationship between KM and SCA was positive and significant indicating that businesses with more KM orientation possess has higher capability of creating SCA.

However, correlations can only reveal the degree of relationship/association between research variables. To understand the direct and indirect effects (mediating effects) among the variables, further analysis by structural equation model (SEM) was employed.

Structure equation modeling

SEM of Amos 16.0 was implemented for testing the relationships hypothesized in the proposed research model.

The first step in model estimation was to examine the goodness of fit of the hypothesized model. The results of SEM analysis - displayed below the model in Figure 2- showed that the model satisfied an acceptable level of model fit (χ^2 = 99.52, χ^2/ df = 2.4 which was smaller than 3 recommended by Bogozzi and Yi (1988). The Goodness of fit index (GFI) is 0.85 just below the recommended cut off level of 0.9 suggested by Hair et al. (1995), root mean-square error of approximation (RMSEA) is 0.1 just above the cut off level of 0.08 suggested by Hair et al. (1995), the adjusted goodness-of-fit index (AGFI) is 0.76, almost at the recommended cut-off level of 0.8 (Chau and Hu, 2001). The combination of these results provided support to the overall validity of the structural model (i.e. good fit with the data collected), therefore the next step of path analysis could be meaningfully performed.

The second step in model estimation was to examine the significance of each hypothesized path in the research model to test our hypotheses. This would be achieved through examining the Beta coefficient of each path, P value, and squared multiple correlations (R^2). All paths were estimated using the Maximum Likelihood (ML) method which is the most widely used estimation procedure in structural equation modeling. A few assumptions need fulfilling in order to use the ML method: (1) Reasonable sample size (100:150) as suggested by Hair *et al.,* 2006) to achieve stable ML estimates results.(2) The hypothesized model is valid. (3)The distribution of the observed variables is multivariate normal

The data collected for this study met the first criteria. The hypothesized model was developed from theories and some empirical findings, and thus was assumed valid. Finally the normality of the observed variables was tested, following the rule of thumb suggested by West *et al.* (1995): *"for a sample size of 200 or less, moderately non-normal data (univariate skewness < |2|, univariate kurtosis < |7|)" are acceptable*. Recent research also shows that ML estimation

method can be used for data with minor deviations from normality (Raykov and Widaman, 1995 in Wang and Ahmed, 2004). The normality test was performed for the data collected; the skewness of each variable was less than|1.1|. The univariate kurtosis of each variable was less than |1.8|. Thus, the third assumption of ML method was also met.

The results of path analysis are presented in Figure 2 and summarized in Table 3 below.

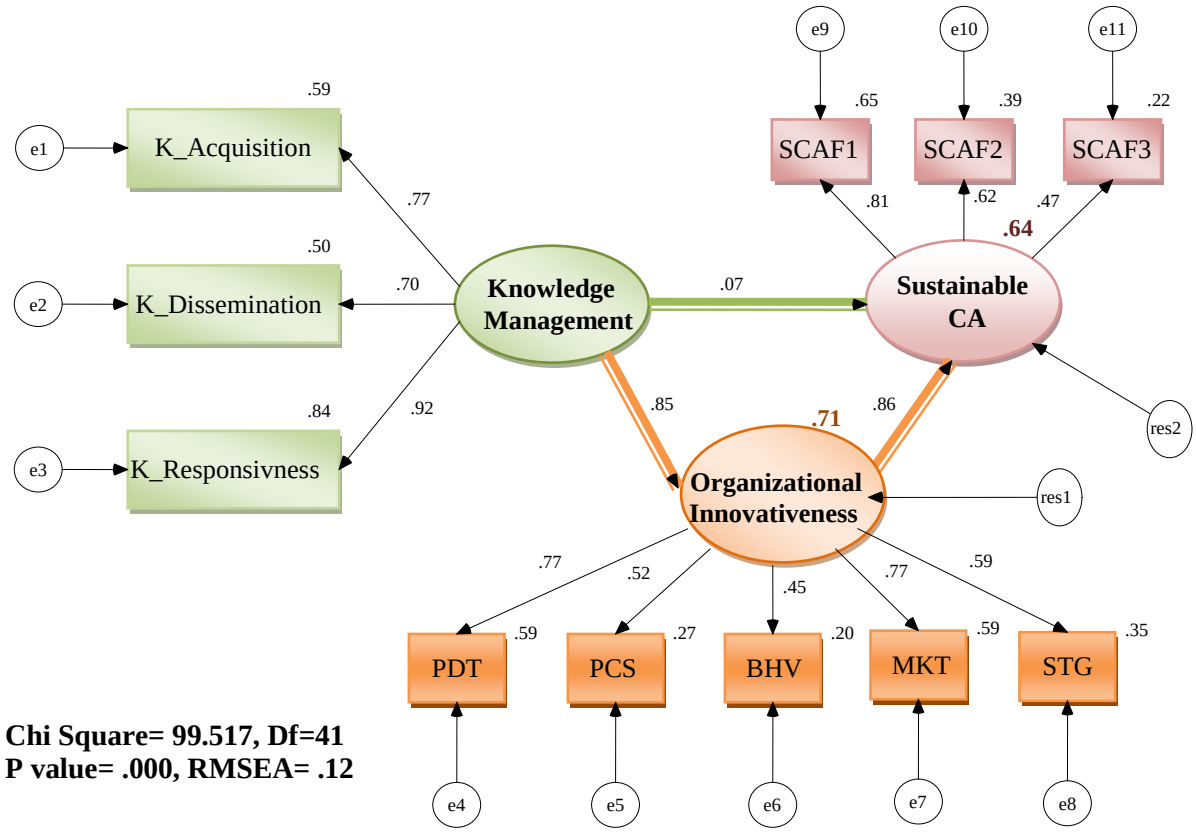

Figure 2 structure equation modeling

According to the reported results, the direct effect between KM and OI is positive and significant (Beta coefficient is 0.85), $p < 0.01$, therefore H1 is accepted. The direct effect between OI and SCA is positive and significant (Beta coefficient is 0.86), $p < 0.01$, therefore H2 is accepted as well.

The direct effect between KM and SCA tends to be zero (Beta coefficient is 0.07), however the indirect effect (the effect between KM and SCA through OI) is positive and significant (Beta coefficient is 0.66, p value < 0.01). A significant indirect effect indicates that a significant quantity of the independent variable's total effect on the dependent variable occurs via the mediator (Rhee *et al.,* 2009). This means that OI is a perfect mediator between KM and SCA. Hence therefore H3 is accepted.

Discussion

The paper proposed and empirically tested a model investigate the relationship between KM, OI and SCA. The results confirmed the following relationships:

First, the relationship between KM and OI was statistically significant and positive. This finding of the influential effect of KM to innovativeness wass consistent with prior studies by Davenport and Prusak (1998); Galunic and Rodan (1998) and Gloet and Terziovski (2004) who indicated that KM competency is critical to successful innovation. This finding was asserted also observed by Darroch (2005) in her study for New Zealand firms, who reported that each of KM processes were positively related to influence innovation. Recent literature also supported this relationship as emphasized by Gupta (2009) and Rhee *et al.* (2009) who stated that by establishing excellent KM systems, it is possible for organizations to make effective use of its own resources so they can accumulate business management experience and reach their goals for organizational innovation. Ellonen *et al.* (2009) emphasized also that a firm's ability to combine and effectively use different types of knowledge was crucial to its success in innovation activities and performance.

Second, the relationship between OI and SCA was positive and statistically significant. This finding was also consistent with the previous literature (e.g. Damnpour 1989; Doyle, 1998; Damnpour, 1991; Quinn, 2000; Lemon and Sahota, 2004; Lee *et al.*, 2005; Darroch, 2005; Wang *et al.,* 2006; Alegre and Plessis *et al.*, 2007; Chiva, 2008; Liao, 2008; Cooper *et al.*, 2008; and Rhee *et al.*, 2009. From an RBV perspective, Galende (2006) pointed out that innovative capability does not come from skill in exploiting external technologies; which are easily accessible for competitors and therefore insufficient for sustaining a CA (Barney, 1991). Rather, it comes from the generation of internal innovation, which implies the possession of heterogeneous and specific technological resources, and the capability to generate other new resources. Hult *et al.*(2004) indicated also that in order to respond to the turbulent environment, it is important to fuel innovativeness, which is critical to achieving a competitive edge and performance.

Third, OI mediated the relationship between KM and SCA. Empirical evidence shows that the relationship between KM and SCA was significant with indirect effect of *OI*. In other words, in order to generate and maintain CA, KM must affect some or all dimensions of OI. If KM does not lead to any form of OI, the relationship between KM and SCA would be questionable. This finding goes is consistent with the views of with many scholars who argue that innovation is a mechanism by which organizations can draw upon core competencies and transform these into performance outcomes critical for success (Barney 1991; Reed and DeFillippi 1991; Han et al. 1998; Hu and Gonzalez *et al.*, 2007). For example, Hult *et al.* (2004) indicated that innovativeness is likely to be a strategic means by which firms deal with changes in the internal and external environments. This finding supports also the suggestion of Gold (2001) that organization innovation is an intermediate outcome of effective knowledge management. Han *et al.* (1998) suggested that innovation might be a mediating factor between KM and performance as well.

Conclusion

This study contributes to the growing body of literature linking KM and the RBV and provides empirical evidence of the RBV of KM as an organization capability. The study also demonstrated the importance of KM and its relationship with OI and SCA. Many studies confirmed the relationship between KM and SCA as have been discussed earlier, however more research in understanding the underlying mechanisms through which this is achieved was needed(e.g. Chuang, 2004). This study contributes to this area of research by providing one possible explanation for this mechanism; that is KM capabilities fostering the process of building innovation capabilities that is in turn leads to sustaining the organization CA. This study has also added to empirical work of relating KM and OI constructs. As has been emphasized in the literature that although many studies have reported aspects of KM as antecedents of innovation and emphasized that effective KM has been represented in the literature as one method for improving innovation and performance, empirical work is still in its infancy and characterized by heterogeneous measurement approaches and mixed results .

Managerial implications

Many managers seek to identify likely benefits that might be incurred by implementing KM systems. This study has shown that organizations with well-developed KM practices and behaviors are more innovative and achieve SCA. The results reported in this study are important because they show that, in order to be innovative, having knowledge is as important as what is done with that knowledge. Since the empirical results of the study found that OI mediates the relationship between KM and SCA, managers should also pay more focus in building their organizations' innovation capabilities. By thoroughly building innovation capability, KM implementation will lead to organization SCA.

Study limitation

This study used single-informant reports to measure each of the theoretical constructs. Nonetheless, possible over-reporting or underreporting of certain phenomenon may occur as a result of the executive job's satisfaction or personal and role characteristics. The generalizability of results is another limitation of this study. The study is conducted in a specific national context; Egyptian software companies. Although the software companies sector being studied provided an appropriate setting, research in other industries is required. Further, the sample size is relatively small, requiring the increased sample size. Also, over representation of small and medium size organizations with 500 or less employees limits the generalizability of the results. However the effect of organization size on KM is unknown. Finally, using a cross-sectional data with questionnaires was another limitation. In the future this limitation should be overcome using longitudinal data

Future research

This research used static structure equation model to investigate the relationship among the research variables, in future studies dynamic structure equation modeling with feedback paths/loops such as positive feedback between SCA and knowledge acquisition would be of interest to study. Also, the inclusion of the moderator variables, such as industry characteristics, and culture dimension into the model could reveal more information therefore,

further confirmation of the results reported in this study in other contexts/ countries would be of importance.

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Table 1 Operational definitions of research variables

Variable	Operational Definition	Supporting authors
Knowledge Management	Degree of (i). Knowledge Acquisition (ii). Knowledge Dissemination (iii). Responsiveness to Knowledge	Darroch (2003; 2005); Darroch *et al.*(2002; 2003), Gold (2001), Gold *et al.* (2001); and Almeida (1996)
Organizational Innovativeness	Degree of (i). Product Innovativeness (ii). Market Innovativeness (iii). Process Innovativeness (iv). Behavioral Innovativeness (v). Strategic Innovativeness	Wang and Ahmed (2004)
Sustainable Competitive Advantage	Degree of (i). Relative innovative performance (ii). Resistance of innovative capabilities erosion by other competitors (iii). Resistance of internal distinctive capabilities erosion on which advantages have been founded	Weerawardena (2003)

Table 2: Results of correlations coefficients between research variable

Variable	M	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Knowledge Acquisition (KA)	3.86	0.46	**0.81**													
2. Knowledge Dissemination (KD)	3.53	0.54	0.68**	**0.80**												
3. Responsiveness to Knowledge (KR)	3.76	0.49	0.66**	0.66**	**0.79**											
4. Product Innovativeness	3.89	0.73	0.41**	0.45	0.58**	**0.81**										
5. Process Innovativeness	3.77	0.66	0.27*	0.47**	0.40**	0.22*	**0.80**									
6. Market Innovativeness	3.65	0.60	0.41**	0.49**	0.58**	0.67**	0.45**	**0.67**								
7. Behavior Innovativeness	4.07	0.67	0.33**	0.24*	0.29**	0.09	0.49**	0.20*	**0.83**							
8. Strategic Innovativeness	3.98	0.53	0.34**	0.22*	0.40**	0.35**	0.19*	0.33**	0.32*	**0.61**						
9. Relative Innovation performance (SCAF1)	3.95	0.714	0.41**	0.37**	0.42*	0.49**	0.23*	0.40**	0.06	0.29**	**0.80**					
10. Resistance of innovation capability erosion (SCAF2)	3.50	0.76	0.26**	0.31*	0.37**	0.46**	0.30**	0.40**	0.30**	0.41**	0.40**	**0.70**				
11.Resistance of internal capability erosion (SCAF3)	3.12	0.68	0.18	0.34**	0.19	0.26**	0.17*	0.25**	-0.04	0.22*	0.42**	0.25**	**0.63**			
12. Knowledge Management (KM)	3.52	0.55	0.88**	0.89**	0.85**	0.52**	0.43**	0.55**	0.30**	0.35**	0.46**	0.34**	0.29**	**0.84**		
13. Organizational Innovativeness (OI)	3.82	0.43	0.51**	0.55**	0.65**	0.69**	0.71**	0.77**	0.58**	0.58**	0.45**	0.53**	0.25**	0.63**	**0.87**	
14. Sustainable Competitive Advantage	3.87	0.46	0.37**	0.44**	0.45**	0.52**	0.32**	0.46**	0.18*	0.41**	0.76**	0.77**	0.69**	0.47**	0.56**	**0.80**

1.1.1.1.1.1.1.1.1 Note: α is located in Bold on the diagonal

1.1.1.1.1.1.1.1.2 *Significant at p < 0.05, **Significant at p < 0.01

Table 3 Results of structural model path analysis

Hypothesis.	Hypothesized Path	Total effect	Direct effect	Indirect effect
H1	KMand Organizational Innovativeness	0.85**	0.85**	N/A
H2	Organizational Innovativeness and SCA	0.86**	0.86**	N/A
H3	KMand SCA	0.73**	0.07	0.66**

**Significant at p< 0.01