

Knowledge Management Capabilities and Its Impact on Product Innovation in SME's

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Abstract

Purpose–This study aims to explore the impact of Knowledge Management Capabilities (KMC), captured by six dimensions, on product innovation in Information Technology (IT) Small and Medium Enterprises (SMEs).

Design/methodology/approach–Survey data were collected from 210 managers in (35) IT SMEs located in Jordan. SPSS was employed to analyze the data.

Findings–Two key findings emerged: first, among the six dimensions of KMC, only acquisition, sharing, application, and protection were found to be positively associated with products innovation, whereas knowledge creation and storing were not. Second, no significant differences were identified in employees' answers due to company size.

Research limitations/implications–This study was restricted to small and medium size enterprises, and therefore, the findings of this study may not be generalized to large enterprises. Additionally, this study was confined to the Jordanian IT sector only, thus, the findings need to be interpreted with cautious as they may not be generalized to other sectors.

Originality/value–this study advances our understanding of the nature of the relationship between knowledge and innovation.

Keywords: knowledge management capabilities, product innovation, small and medium enterprises SME's, information technology

1. Introduction

Small and Medium Enterprises (SMEs) are considered as one of the most important types of business organizations of the economic structure of any country. They play an important role in increasing production, absorbing large numbers of the workforce, improving revenue, enhancing income, and advancing creativity and technological progress. SMEs' shares could reach (75%) of economic activity in many countries (World Bank (WB), 2014). Great support and attention have been devoted SMEs by international organizations such as the United Nations, the World Trade Organization and the Industrial Development Bank in order to further improve these enterprises.

Studies have shown that many developed countries such as European countries and North America rely on small and medium-sized organizations dramatically where these companies represent a large proportion of the total workforce in most countries of the world institutions. In Jordan, SMEs' represent (97%) of the total operating companies (the Department of Statistics DOS, 2011-2006) and their contribution to the national economy is more than (50%) of GDP. They also employ more than (60%) of Jordanian workforce and create up to (70%) of new jobs (SME agenda, 2011, the Department of Statistics DOS, 2011.2010). Thus, the success of small and medium-sized enterprises is very important to the Jordanian economy due to the size of employment in these companies and their contribution to GDP.

The global changes in markets and the continuous changes in consumers' tastes require a high level of organizational flexibility. Such an issue may impose additional challenges on the operations of SMEs, given their limited size of resources. Thus, investigating the mechanisms of how SMEs could further improve their operations, particularly in developing countries such as Jordan, becomes of significant importance since it would aid them to understand how to survive in a highly violent and turbulent environment.

Due to the nature of SMEs which basically focus on the quality and the adoption of best production practices,

knowledge management capabilities (KMCs) of exploration, storage, exchange and dissemination of this knowledge can lead to innovation and ensure the best performance of SMEs (Nunes, Annansingh, Eaglestone & Wakefield, 2006). This notion is supported by prior research, which indicates that creativity significantly fuels the economic growth, and that creativity is one of the core competitive advantages of organizations (Reed & DeFillippi, 1991; Barney, 1991).

Accordingly, the current study aims to examine the extent to which KMCs of IT sector in Jordan affect product innovation. The volume of investment in this sector is (3.6) billion USD, of which (2.5) billion US dollars as foreign investment. The sector employs more than (11000) workers spread over more (207) companies. The sales volume of the Jordanian IT sector is nearly around (635) million US dollars, and it exports IT' products to more than (30) countries in the world (Information and Communications Technology Association INTAJ, 2013).

Despite that, the sector is facing a number of difficulties in terms of the volatility of the work environment and the fierce competition, which is taking a place at the regional and global levels (INTAJ, 2013). Such issues have resulted in decreasing the number of IT companies operating in Jordanian market and have also led to decrease sales in the years of 2009, 2010 and 2011 and 2012 and amounted to (-6.81% , -22.7% , -4.2%) and (-37.5%) respectively (INTAJ, 2012). These challenges provide additional reasons to investigate how the Jordanian IT sector adopts and practices the concept of KMC and how that leads to product innovation.

Moreover, a review of the extant literature indicates that prior researchers focused on specific aspects of KMCs such as creation, storing, sharing, and application. Other aspects such as acquisition and protection have received a little attention. Thus, a comprehensive study that takes into account the six aspects of KMC is needed in order to truly understand and capture their effect on product innovation. Finally, the majority of previous research was conducted in a western context, and little attention was paid to investigate such relationships in a Middle Eastern context. Such an investigation may offer new and different insights, given that cultural differences. There is a scarce of such studies in Jordanian business environment.

The remainder of this paper is divided into six main sections. The second section describes the theoretical background. The third section provides a scholarly literature review of knowledge management and product innovation. The fourth section provides an outline of the model and hypotheses. The fifth section describes the methodology. The sixth section analyzes the survey data. The final section concludes the main findings.

2. Theoretical Background

2.1 Knowledge Management Capability KMC

A review of the literature reveals that there is no universal or agreed definition of knowledge management (KM) among researchers. For example, De Wit & Meyer (1998) defined KM by the ability of human being to understand things and to distinguish them and drawing cognitive maps in order to store this knowledge. On the other hand, Nonaka & Takeuchi, (1995) described KM as a true belief and faith investigator who is working to increase the effectiveness and performance of the individual or entity. This definition emphasizes on performance and output. Yet, Davenport & Prusak (1998), viewed KM as a key resource of the organization and a component of the intellectual capital of the organization, which led to define KM from integrative perspective between information and human resources systems. For them, KM is a combination of technical skills and application expertise, technologies, and customer relationships.

By reviewing the theoretical literature, the knowledge management capabilities defined as a mixture combines the knowledge infrastructure (some called it the elements or potential (Enablers)) with knowledge management processes. While other researchers explained that knowledge management capabilities are divided into two sections: The first section of infrastructure for knowledge capabilities of (Systems & Technology), (Organizational Learning), (organization's Culture) and (organization's Strategy) the second section is the operational knowledge processes capabilities which include acquisition, conversion, application, and protection (Gold, Malhotra & Segars, 2001). And from this view KM integrated with organization learning, strategy, culture and systems and technology (Jashapara, 2011: 328-329) he sees that all the resources contained previously linked to each other in order to form cognitive abilities of any of the organization, organizational learning processes actors associated with the discovery of and the application and dissemination of human knowledge (implicit and explicit), which are used appropriate technology and organizational culture as well as the organization's strategy aimed at improving intellectual capital and Organizational performance. This supports the view that the infrastructure for knowledge management dimensions consist of organization's culture, organizational structures, and the structure of information technology, and general knowledge as well as the organization buildings, environment surrounded and equipment that operate on the ease of dissemination of knowledge in an informal way circumference (Becerra-Fernandez, Gonzalez, Sabherwal, 2004: 46-47).

2.1.1 KMC Dimensions

Referring to the contribution of researchers in determining the dimensions of the knowledge management processes

capabilities, we find that (Quintas et al., 1997) has identified the dimensions of the Organization's ability to gather knowledge, acquisition, dissemination and application while Gold et al. (2001) identified the KMC as ability to convert, acquire, application and Knowledge protection. Alavi & Leidner (2001) was defined it as knowledge creation, storing, dissemination and application, (Becerra-Fernandez et al. (2004) classified them to the knowledge discovery, knowledge capturing, knowledge sharing and finally knowledge application.

2.1.1.1 Knowledge Acquisition

Knowledge acquisition can be possessed through two perspectives: First, the ability to generate new knowledge through the application of existing knowledge. Second, the ability to improve the existing knowledge and the effective acquiring and using of new acquired knowledge (Gold, Malhotra & Sergas, 2001). Massa & Testa (2009) see that the possession of the knowledge represents the flow of knowledge from external sources into the cognitive organization stocks. While others pointed out that it can be defined as possession of the knowledge that a generation or knowledge developed which refers to the identification of knowledge and activity in the converted and representation which can be used and get benefits from the environment (Holsapple & Joshi, 2003).

According to the knowledge generation theory (Nonaka & Takeuchi, 1995) noted that the acquisition of knowledge is linked to the ability to transfer knowledge from the tacit knowledge to explicit knowledge and vice versa, through the knowledge and practice which lead to absorb this knowledge and therefore the possibility of transfer and diffusion.

2.1.1.2 Knowledge Creation

Knowledge creation is too important for organizations knowledge source and it is process of development of new knowledge within the company, which includes operations or improve the use of new applications of existing knowledge already. While the knowledge acquisition process represents the flow of external knowledge of stocks and external knowledge to the organization (Massa & Testa, 2009).

While (Marquadt, 2002) looks into knowledge creation as the basis for the competitive advantage of the organization, so it is essential for the Organization to seek, generate and create the new knowledge by relying on the expertise, creativity and R & D support in addition motivating individuals and creating the right environment to achieve this.

(Nonaka, von Krogh, & Voelpel, 2006) urges organizations to generate knowledge internally because the internal knowledge that are created within the organization can offer new ideas and contribute to an effective contribution to the achievements of the organization, as well as adding new ways to facilitate the process of achieving the goals, because this knowledge can be a unique and difficult for competitors to imitate.

2.1.1.3 Knowledge Storing

Knowledge created and knowledge acquired must be stored within the organization databases to be used by workers in various Organizations' departments (Storey & Kelly, 2002). This knowledge form the substance and the whole organization memory: so this knowledge has to be meaningful and useful, it should be coded, classified, configured and stored properly, only then this knowledge can be used and re-used by the right person, at the right time in the right way, when it is needed, this knowledge becomes the property of the organization as a whole and must be preserved (Nemati, 2002).

Several studies indicated that there is close association between knowledge, storage, and stimulate creativity in the organization where (Chang & Lee, 2007) found that the greater the storage and accumulation of knowledge in the organization the more creativity Organizational, and the stored knowledge retain, sustain and this will lead to facilitate the dissemination of knowledge among employees by enabling them to access and deal with it at the right time and in an effective way, which contributes to reduce the time and cost incurred by the organization (Lestari, Astuti, Alhabsji, Syafii (2011); Chang, Lee, (2007); Lee, Leong, Hew, Ooi, (2013)).

2.1.1.4 Knowledge Sharing

There are many definitions for the knowledge sharing some named it as knowledge dissemination, knowledge transfer or knowledge distribution among employees (Davenport & Prusak, 1998). Knowledge Transfer requires a group or individual's desire to work with others, and share knowledge is mutual interest, thus if there was not involved in the knowledge sharing it is almost impossible for the knowledge that passed from one person to another person. So knowledge participation is essential condition of knowledge building (Syed-Ikhsan & Rowland, 2004).

Daudelin & Hall (2000) mentioned the importance of the publication and distribution of knowledge which includes: the reformulation of individuals vision will help to understand the idea, offer ideas and report about it to others also opens up opportunities for the reactions that can lead to a change in perspective or insight It also provides more opportunity to influence the learning of others.

This is indicated by (Hsu & Wang, 2008), where they found that the policies and practices of the exchange of

knowledge can improve the effectiveness of the knowledge and practices of participatory knowledge-sharing, which in turn can lead to improved sharing of knowledge among employees to achieve competitive advantage. From the standpoint of (Wu et al., 2012), the process of knowledge sharing is a major source of creativity.

2.1.1.5 Knowledge Application

Organization ability to effectively apply the knowledge to future use and to respond to the changes surrounding is very important such as the importance of knowledge itself in order to improve the organization's performance. And can easily say that the knowledge application process is the ability to apply, and the exploitation and use of knowledge (Gold, Malhotra & Segars, 2001). Knowledge application also defined as organization response of knowledge, and that reflect the organization's ability to respond to different types of information that has access to it (Lee, Leong, Hew & Ooi, 2013).

While another pointed out that the knowledge application is the ability to retrieve and use of knowledge to support the decisions and actions, problem solving and automating routine business and provide measures to facilitate business (Rastogi, 2000). Also Atuahene-Gima (2005) mentioned that the knowledge application helps to improve relations with customers, leading to the creation of new products that meet their needs and desires.

knowledge application process associated with the impact of knowledge and effectiveness and utilization in terms of the search for new ways to use and exploit this knowledge as a key resource of the organization in various fields to achieve competitiveness as much as possible, as the organization's performance depends very much on the organization's ability to exploit the knowledge of the production and delivery of other products and services to its customers through the use of its capabilities (Nielsen, 2006).

2.1.1.6 Knowledge Protection

In general Knowledge protection can be defined as the ability to protect the knowledge and to secure knowledge from inappropriate or illegal use or protect them from theft (Gold, Malhotra & Segars, 2001). The accepted mechanisms for organizations to protect the knowledge like surveillance cameras is to protect the knowledge from inappropriate use or that are being leaked inside and outside the organization, also restrict access to some sources of knowledge through technology but through password.

Intellectual property rights and legal contracts, including intellectual property rights, patents, trademarks, copyrights, trade secrets, contracts, are the most common formal mechanisms to prevent the knowledge acquisition and protection of innovations and creations which enables companies to maintain the creations thoroughbreds and delay imitated. The terms of the contracts covered supports cooperation between companies through non-disclosure agreements relating to staff and non-competition agreements (Hertzfeld, Link & Vonortas, 2006).

2.2 Product Innovation Dimensions

Product innovation includes two dimensions (a) Units creativity which it is the improving the product specifications or product units. (b) Architecture creativity which deals with changes on the products and changes between product units relations that leads the functions of the product itself (Basu, 2014). Products creativity plays an important role in the field of new business so that it can provide opportunities for companies in terms of growth and expansion into new areas as well as to allow companies to gain competitive advantage (Abu Baker & Ahmad, 2010). The production of developing new products or improvement of existing products is the goal of products creativity (Leiponen & Helfat, 2010).

3. Literature Review

Researchers have varied trends theory, which dealt with the concept of creativity and innovation, which led to a divergence of views on the definition, and this is due to overlapping considerations and needs of social, political, economic, and differing standards which is the basis for the consideration of the individual creative or non-creative. Although it has evolved many theories and studies and research in innovation.

Among the most famous definitions of creativity, which includes the various components of creativity definition Torrance, defined creativity as “*the process of becoming sensitive to problems, deficiencies, gaps in knowledge, missing elements, disharmonies, and so on; identifying the difficult; searching for solutions, making guesses, or formulating hypotheses and possibly modifying them and retesting them; and finally communicating the results*”. (Torrance, E. P, 1966).

Massa and Testa (2009) explored two different ways of managing knowledge to investigate how organizations manage, exploit, and feed their knowledge in order to achieve a competitive advantage; marketing knowledge domain and technology knowledge domain. The marketing knowledge domain is nourished by a variety of external knowledge sources, mainly connected to customers and market trends. The technology knowledge domain is informed by a

relatively small number of external knowledge sources, as it relies mainly on internal competences that are enhanced by appropriate organizational devices. Results showed that organizations that use two ways of managing knowledge can acquire, create relevant knowledge from internal and external organizational resources, and then they share and apply the stored knowledge to generate innovation in order to satisfy market needs, to gain more competitive advantage than others. Malkawi and Abu Rumman (2016) found in their study on the IT SME's that there is a significant impact of KMC on organizational creativity (Process and Technological creativity).

In the Saini (2015) study on the SME's of software, pharmaceutical and textiles industries in north India, the researcher found that there is a relationship and impact between KM processes (capturing, sharing, transfer, storing, reuse) on the innovation in the SME's and it creates sustainable competitive advantage for these firms.

Depending on the literature Bharadwaj et al. (2015) divided the KMC into two parts; infrastructural capabilities (information technology, knowledge structure, knowledge culture) and process capabilities (acquisition, storing, dissemination, application) and they found that both capabilities (infrastructural and process) are important to knowledge management effectiveness. In their study Mageswari et al. (2015) revealed that the infrastructural capabilities partially impact the knowledge management processes (acquisition, creation, sharing, storing) in the Indian small firms, and it is only the knowledge acquisition has a significant impact on the innovation in the small firms.

Dos Santos Ferreira and Santos (2014) found that the knowledge management dimensions (Sharing, use, accumulation, internalization, creation) positively impact the innovation. They found that knowledge creation is the most important dimension impact the innovation. In their proposed model Nicolau et al. (2013) showed the importance of knowledge management processes and deal with it as a system and building a friendly environment in addition to combine between internal and external knowledge in order to support innovation. Jenny and Maria (2013) found in their study that there is a positive impact of the knowledge management capabilities on the product and process innovation, the product and process innovation moderate and strengthen the relationship between KMC and SME's performance in the Spanish IT SME's. In electronic industry Zohoori et al (2013) found that the knowledge sharing of the explicit and implicit knowledge is playing an important role in product innovation which supporting the electronic industry and enhancing the economic growth for different businesses.

From the previous studies we can imagine how knowledge management capabilities impact and support the product innovation in SME's that works on the Jordanian IT sector.

4. Research Model and Hypotheses

Depending on the literature review the researchers urge to propose the knowledge gained during the SME's evolution and its impact on product in order to improve business sustainability. The study model consists of two kinds of variables: an independent variable, which is Knowledge management capability construct, and dependent variable which it is product innovation construct.

As mentioned above the KMC will consist Knowledge acquisition, knowledge creation, knowledge storing, knowledge sharing, knowledge application and knowledge protection.

4.1 The Model

The Proposed model in figure (1) as follows.

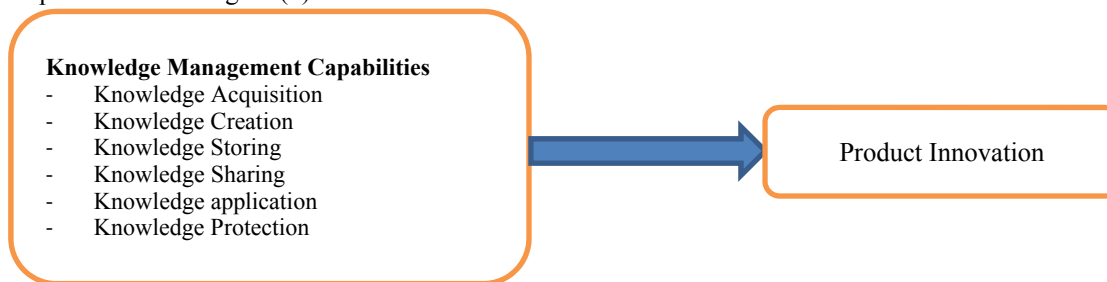


Figure 1. Research Model

4.2 Hypotheses

According the arguments presented in this part the following hypotheses constructed:

H1o. There is no statistically significant impact of knowledge management capabilities at ($\alpha \leq 0.05$) of on Product innovation

H2o. There is no statistically significant difference in assessments of the knowledge management capabilities

dimensions of the surveyed companies whether the company small or medium.

H3o. There is no statistically significant difference in assessments of the Product innovation of the surveyed companies whether the company small or medium.

5. Methodology

5.1 Population and Sampling

The study population includes the managerial levels in SMEs of Information Technology sector of Jordan. The criterion used for size defines SMEs as firms that fulfil the criteria of Amman chamber of Industry and Trade and industry ministry: firms that employ fewer than (250) workers as below classification, Firms that met the previous requirements were (207) firms. The data were gathered during November 2014. The number of firms selected were 45 firms, and we distributed (300) questionnaire to the top management, middle management and lower management levels in these firms. We receive (210) valid questionnaire ((78) from small and (132) from medium company) with the response rate was (70%), from (35) firms only; (12) were medium firms and (23) small firms.

5.2 Instrument Study

A questionnaire were prepared by researchers in order to collect the study data from random selected firms. For Knowledge management capability it was measured using adapted scale from previous studies (Maponya, 2004; Choi et al., 2008; Earl, 2003; Hsin-Jung Hsieh, 2007). Product innovation measured using the adapted scale from (Li & Calantone, 1998; Gatignon & Xuereb, 1997, Calantone, Cavusgil, & Zhao, 2002). We used a Likert scale from 1 to 5, where 1 represents Strongly Disagree and 5 strongly agree.

5.3 Validity and Reliability of Data

5.3.1 Validity

After preparing the instrument by the researchers it sent to a panel of experts from the academic staff from the Dept. of business administration in Jordanian universities in order to verify the instrument's validity and objectives of the study. Based on the academic panel suggestions and comments some modifications were been made on the instrument.

5.3.2 Reliability

The reliability of the collected data was measured using Cronbach alpha coefficient; the reliability test was conducted to check for inter-item correlation of all variables in the questionnaire. The scale's reliability was good, the Alpha Cronbach obtained was as *Table (2)* alpha cronbach was (0.928) for the scale of KM capabilities and (0.761) for the scale product innovation (the recommended acceptable minimum is (0.70), according to Hair et al., 2004, Sekaran & Bougie, 2010), confirming the scale's internal consistency.

5.4 Data Analysis and Results

In order to test the hypotheses, the following tools were used: multiple regression and stepwise analysis were used to assess the effect of Knowledge management capabilities on product innovation in Jordanian IT SME's. This study employs the regression analysis to explore the relationship between knowledge management capabilities, and product innovation. Also t-test to test the significant of means differences of study variables in addition to the descriptive statistics.

Analysis of first hypotheses:

H1o. There is no statistically significant impact of knowledge management capabilities on Product innovation.

In below table 1 the summary of results.

Table 1. Summary of Stepwise regression for the relation between KMC and Product Innovation

	r	R ²	f	Sig f	B	Standardized β	t	Sig(t)
Knowledge Sharing						0.264	3.59	0.000*
Knowledge Protection						0.288	5.11	0.000*
Knowledge Application						0.168	2.58	0.010*
Knowledge Acquisition	0.695	0.483	47.92	0.000*	0.548	0.166	2.40	0.017*
Knowledge Creation						0.001	0.02	0.983
Knowledge Storing						0.048	0.66	0.510

The study found that: there is positive statistically significant relationship between KMC dimensions (Knowledge Sharing, Knowledge Protection, Knowledge Application, and Knowledge Acquisition) and product innovation in Jordanian IT SME's. This result is consistent with previous studies in terms of the impact and direction. Pinar & Kor

(2010) and Tseng et.al. (2011) found that there is positive impact of KMC on product innovation. Also the results consistent with Mohammed & Basheer(2011), Al-Duri & Al-Azzawi (2004), Abdelqader et.al(2013) which found that Knowledge capabilities correlated and integrated with the innovation and it accelerates producing new products with more quality and less cost, also the study consistent with Jenny & Maria (2013) found that KMC have positive impact on product innovation Spanish IT SME's. This study not consistent with Ferraresi et.al. (2012) study which found that there is no direct impact between KMC and innovation unless there is a Strategic orientation and innovation as a moderator variable. Although this study consistent with Mageswari et.al. (2015) that knowledge creation and storing have no significant impact on innovation.

Analysis of the second hypotheses:

H2o. There is no statistically significant difference in assessments of the knowledge management capabilities dimensions of the surveyed companies whether the company small or medium.

According to the tests results as shown below in *Table (2)* the study found that: there is no statistically significant difference in assessments of KMC of the surveyed companies in Jordanian IT SME's whether the company small or medium. The researchers think that because of the study on a specific industry it is acceptable to have no differences in the results whether the companies are small or medium.

Table 2. Means and Std. Dev., and t-test for KMC according the company size

	Size	N	Mean	Std. Deviation	t	Sig
Knowledge Acquisition	Small	78	3.97	0.48	0.15	0.881
	Medium	132	3.95	0.55		
Knowledge Creation	Small	78	4.10	0.47	2.09	0.038
	Medium	132	3.95	0.55		
Knowledge Storing	Small	78	4.90	0.58	2.11	0.036
	Medium	132	3.89	0.69		
Knowledge Sharing	Small	78	3.78	0.59	1.22	0.221
	Medium	132	3.67	0.66		
Knowledge Application	Small	78	4.03	0.58	1.44	0.149
	Medium	132	3.91	0.59		
Knowledge Protection	Small	78	3.79	0.84	1.56	0.120
	Medium	132	3.95	0.64		
Knowledge Management Capabilities	Small	78	3.96	0.41	1.09	0.277
	Medium	132	3.89	0.50		

Analysis of the third hypotheses:

H3o. There is no statistically significant difference in assessments of the Product innovation of the surveyed companies whether the company small or medium.

According to the tests results as shown below in *Table (3)* the study found that: there is no statistically significant difference in assessments of the product innovation of the surveyed companies in Jordanian IT SME's whether the company small or medium and this could be because the number of employees in the two types of companies is too close, also these companies are working within the same sector which has the same legislations and the same obstacles.

Table 3. Means and Std. Dev., and t-test for Product innovation according the company size

	Size	N	Mean	Std. Deviation	t	Sig
Product Innovation	Small	78	3.91	0.59	0.20	0.84
	Medium	132	3.93	0.63		

6. Conclusion

The main purpose of this study is to examine the effect of knowledge management capabilities on product innovation in Jordanian IT SME's, collecting data from (35) SME's working in IT sector of Jordan by using an adapted questionnaire. After analyzing (210) collected questionnaire the empirical study results revealed that there is a positive impact of KMC (Acquisition, Sharing, Application, and Protection) on the product innovation in Jordanian IT SME's. these findings are consistent with the previous studies that have shown that there is a significant effect of knowledge management on the product innovation, and it shows the importance of KMC in IT companies which lead to produce new IT products and applications in a short time frame with high quality and low cost.

The study also found that there is no variance differences between employee's answers for the KMC and product innovation variables according the company size they are working for whether it is small or medium size. For future studies the researchers recommend to make such study in different SME's working in other industries than the IT sector, and to study the impact of KMC on the big size companies.

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