The Relationship between Knowledge Management and Innovation in Turkish Service and High-Tech Firms

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Abstract

Knowledge management, innovativeness and innovation have an important impact on business development and survival. Empirically analyzing these three concepts is critical because of the importance of these concepts for creating competitive advantage. Organizations need to generate, modify, and manage knowledge in order to maintain their innovation capability. This study examines the relationship between effective knowledge management processes and innovation types in organizations as well as shedding light on the mediating effect of innovativeness on the link between knowledge management process and innovation types. Survey data collected from 103 participants in Turkey. The results of the study show that knowledge management processes relate positively to innovativeness, which in turn increases innovations in organizations.

Keywords: Knowledge management, innovation, innovation types.

1. Introduction

Efficiently used knowledge is not only an important intellectual asset, but also a useful tool for organizations to effectively compete in the increased levels of market competition (Carneiro, 2000; Alavi & Leidner, 2001). According to Drucker (1995, p. 271), "knowledge has become the key economic resource and the dominant-and perhaps even the only-source of comparative advantage." Organizations can enhance the generation of new ideas and/or knowledge, knowledge availability, application of the existing knowledge and communication within knowledge-workers by effectively managing the knowledge (Plessis, 2007; Carneiro, 2000; Huang&Li, 2009; Lin &Lee, 2005; Alavi&Leidner, 2001; Nonaka&Takeuchi, 1995; Beijerse, 1999). Not only scholars but also practitioners are putting more and more emphasis on knowledge management (KM), which includes the steps of application, acquisition, and sharing of knowledge and stands as one of the critical factors for organizations to gain competitive advantage (Davenport&Prusak, 1998; Conner&Prahalad, 1996; Hall, 2006; Tippins&Sohi, 2003).

Another important factor that has a profound influence on organization's performance, survivability, and competitiveness - is innovation (Damanpour, 1991; Plessis, 2007; Kanter, 1984; Huang&Li, 2009). Innovation can be described as a generation, development, and implementation of something new into the organization as well as the expansion of new products, services, processes, technologies, administrative systems or structures (Knight, 1967; Thompson, 1965; Damanpour, 1991; Daft, 1982; Damanpour&Evan, 1984; Zaltman*et al.*, 1973). It has been also defined as a knowledge process that transforms knowledge into new products and services (Wilson, 2007). According to these definitions, organizational innovation includes different types of innovations pertaining to all parts and operations of an organization rather than being represented by a single dimension as described in some previous studies (Cooper, 1998; Damanpour, 1987). Scholars have long argued that there are different types of innovation associated with distinct processes in organizations (Knight, 1967; Damanpour, 1988; Gopalakrishnan&Damanpour, 1997).

Prior research reveals that there are three pairs of organizational innovation types, which are administrative and technical, product and process, and radical and incremental innovation (Damanpour, 1991; Gopalakrishnan & Damanpour, 1997). These innovation types, which have been categorized as contrasting pairs, have gained increasing attention in previous research.

According to the meta analysis of Damanpour (1991), when different types of innovation is considered in the research studies, there will be more consistent results rather than the analysis of a single innovation. Evan (1966) and Damanpour (1987, 1991) state that the distinction between administrative and technical innovations is particularly important for studies on organizational innovation because it reflects a more general distinction between social structure and technology, and two innovation types can represent changes introduced in a wide range of tasks within organizations.

In organizations, an important antecedent of adopting and implementing different types of innovations is knowledge management (Darroch & McNaughton, 2002; Antonelli, 1999; Carneiro, 2000; Dove, 1999; Nonaka & Takeuchi, 1995) Knowledge management enhances engagement in innovation through generating, using, and sharing new ideas and exploitation of the organization's thinking power (Huang & Li, 2009; Darroch & McNaughton, 2002; Lin&Lee, 2005; Argote*et al.*, 2003; Plessis, 2007). Put another way, it increases the adoption and implementation of innovations by enhancing organizational innovativeness. Nevertheless, there are very few studies in the literature that examine the effects of knowledge management on organizational innovativeness which subsequently increases the adoption and implementation of different innovation types. Accordingly, the primary purpose of the study is to explore the relationships between knowledge management processes (i.e. knowledge acquisition, knowledge application, and knowledge sharing) and two major innovation types. This study also examines the mediating effect of innovativeness on the relationship between knowledge management and innovation. The remainder of the paper proceeds with the theoretical background and the methodology of the study followed by the presentation of the empirical results. Finally, the conclusions, limitations, and future research directions are provided.

2. Research Background and Hypotheses

In competitive environment, knowledge management is an increasingly critical component of sustainable competitive advantage and provides long-term benefits for organizations (Damanpour, 1991; Hurley & Hult, 1998; Darroch & McNaughton, 2002; Alavi & Leidner, 2001). Beijerse (1999, p.102) states that "knowledge management is achieving organizational goals through the strategy-driven motivation and facilitation of knowledge-workers to develop, enhance and use their capability to interpret data and information (by using available sources of information, experience, skills, culture, character, personality, feelings, etc.) through a process of giving meaning to these data and information." Knowledge management is also a management function that allows knowledge sharing and provides easy access to knowledge, know-how, experience, and expertise (Gloet & Terziovski, 2004; Darroch & McNaughton, 2002; Miller, 1999). According to Parlby and Taylor (2000), knowledge management is a business process which relates to creating new knowledge and ensuring usage of knowledge within organization whenever it is necessary. Knowledge management process facilitates another important process in organizations, namely learning process. Effective knowledge management can also increase the amount of knowledge required for organizational members and facilitate the rapid diffusion of knowledge within the organization. Hence, knowledge management has a profound effect on transforming power of knowledge into innovation processes (Huang & Li, 2009; Argote*et al.*, 2003). Many scholars have thus far argued that effective management of knowledge leads to organizational innovation (Huang & Li, 2009; Darroch & McNaughton, 2002; Lin & Lee, 2005; Plessis, 2007; Nonaka & Takeuchi, 1995).

Organizational innovation is a multidimensional concept that pertains to various parts and operations of an organization. The nature of the activities in each innovation type is different, and they necessitate different strategies. There are three pairs of organizational innovation, which are administrative and technical, product and process, and radical and incremental, that has gained significant attention in previous research (Damanpour, 1991; Gopalakrishnan & Damanpour, 1997). Evan (1966) and Damanpour (1987, 1991) state that the distinction between administrative and technical innovations is particularly important for studies in organizational innovation because it reflects a more general distinction between social structure and technology, and the two innovation types can represent changes introduced in a wide range of tasks within organizations.

Similarly, Cooper (1998, p. 498) states that "the distinction between technological and administrative innovation involves the proximity of the change in relation to the organization's operating core." Therefore, in this study, administrative and technical innovations are considered as the two major types of organizational innovation. Damanpour et al. (1989, p.588) define technical innovations as "those that occur in the operating component and affect the technical system of an organization". Gopalakrishnan and Damanpour (1997) state that "administrative innovations pertain to organizational structure, administrative processes, and human resources; these innovations are indirectly related to the basic work activity of the organization and are more directly related to its management". While technical innovations are usually related with the technical core of organizations, administrative innovations are related with the administrative core and social structure of organizations (Daft, 1978; Evan, 1966; Gopalakrishnan & Damanpour, 1997).

Knowledge management processes are expected to influence both administrative and technical innovations (Huang & Li, 2009; Chen & Huang, 2009) in organizations. Knowledge acquisition, which is related with using either existing knowledge or capturing new knowledge (Lin & Lee, 2005, p.176), enhances an organization's ability to efficiently perform its goals as well as increasing organization learning (McElroy, 2000; Grant, 1996; Lin &Lee, 2005). Through acquiring knowledge from both inside and/or outside the organization, each organizational member can increase his/her capacity to transform current knowledge to new knowledge and to generate new knowledge (Yli-Renko*et al.*,2001; Chen & Huang, 2009). Newly acquired knowledge increases stocks of knowledge available to organizations, decreases the uncertainty, and opens new opportunities for both applying and exploiting knowledge, thereby promoting the creation of innovative results (Nonaka & Takeuchi, 1995; Gold *et al*., 2001; Huang &Li, 2009; Argote*et al.*, 2003). As innovation requires a concerted effort and experience in recognizing existing knowledge and capturing new knowledge (Drucker, 1993; Fabrizio, 2009), it basically increases through knowledge acquisition (Darroch & McNaughton, 2002). Accordingly, knowledge acquisition is positively related to innovation.

The second process of knowledge management, knowledge application, is related with the actual use of the current knowledge in order to solve existing problems (Gold *et al.*, 2001; Alavi & Tiwana, 2002), and with making knowledge more active and relevant in creating values for organizations (Bhatt, 2001). Lin and Lee (2005, p.176) define knowledge application as "the business processes through which effective storage and retrieval mechanisms enable a firm to access knowledge easily." By effectively applying knowledge, organizations increase their capabilities of managing different sources and types of knowledge effectively, using the right the knowledge in the right form, decreasing making mistakes, and converting collective knowledge to advantages for organizations (Alavi & Leidner, 2001; Bhatt, 2001; Huang & Li, 2009; Gold *et al.*, 2001). Hence, knowledge application plays an important role in increasing administrative and technical innovation in organizations (Johannessen*et al.*, 1999; Sarin & McDermott, 2003).

Knowledge sharing is defined as a business process that requires collective knowledge, skills and expertise, and dissemination of knowledge across the organizational units (Chen & Huang, 2009; Lin & Lee, 2005). Knowledge sharing also involves the exchange of employee knowledge, experiences, and skills throughout the organizational and the whole organization in order to establish new routines and mental models (Lin, 2007; Nonaka & Takeuchi, 1995). Organizational members can easily access to knowledge by sharing knowledge among themselves and/or across different units, which reduces the amount of time and investment required to gather information. Through reducing time and investment for gathering information and establishing new routines and mental models, organizations can transfer their valuable resources to innovation processes. Additionally, sharing and exchanging knowledge cause high level of participation in learning and joint creation of new knowledge, which are critical for the development innovative ideas (Chen &Huang, 2009; Tsai, 2001). Thus, knowledge-sharing processes tend to be positively associated with innovation.

In line with the previous discussions, the following hypotheses are formulated.

H_{1a}: Knowledge acquisition process will be positively related to administrative innovation.
H_{1b}: Knowledge acquisition process will be positively related to technical innovation.
H_{1c}: Knowledge application process will be positively related to administrative innovation.
H_{1d}: Knowledge application process will be positively related to technical innovation.
H_{1e}: Knowledge sharing process will be positively related to administrative innovation.
H_{1f}: Knowledge sharing process will be positively related to technical innovation.

Innovativeness is one of the importance sources of competitive advantage (Hurley & Hult, 1998). Innovativeness is determined by organization's cultural openness to innovation that is related with members of organization willingness to participate in innovation activities (Van de Ven, 1986; Zaltman*et al.*, 1973; Hurley & Hult, 1998). Dobni (2008, p.543) states that innovativeness is "a multi-dimensional context which includes the intention to be innovative, the infrastructure to support innovation, operational level behaviors necessary to influence a market and value orientation, and the environment to implement innovation." Garcia and Calantone (2003) and Muffatto (1998) claim that innovativeness is the capacity of innovation and innovative climate that has a profound relationship between the firm's existing technological resources, skills, knowledge, capabilities, or strategies in order to foster innovation. Organizational innovativeness is closely related with developing knowledge resources of organizations (Subramanian & Youndt, 2005). Innovativeness also creates basic values, assumptions, and beliefs within the organization that lead employees behavior to transform knowledge into new products, services, processes, technology, and administrative systems or structures, policies, plans, and programs. Acquiring, applying, and sharing knowledge between the functional areas of an organization create conditions to elevate willingness of organizational members to participate in innovation activities. Knowledge sharing can improve close contacts and interactions within an organization which support innovativeness in the organization. When knowledge is applied or acquired by organizations, organizational learning takes place (Darroch & McNaughton, 2002; Nonaka & Takeuchi, 1995) which also has a positive impact on openness to innovation or innovativeness. Additionally, effective management of knowledge increases the stock of knowledge within an organization that develops infrastructure to support innovation and increases the innovativeness of an organization. Therefore, the following hypotheses are developed.

H_{2a}: Knowledge acquisition process will be positively related to innovativeness.
H_{2b}: Knowledge sharing process will be positively related to innovativeness.
H_{2c}: Knowledge application process will be positively related to innovativeness.

Byrd and Turner (2001, p. 44) suggest that innovativeness applies to "culture where the generation, acceptance, and implementation of new ideas, processes, products, and services are the norm." Through innovativeness in the organization, employees socialize to engage in innovation activities, shape the environment to be more innovative, and are shaped by innovative environment. In addition, organizational members' understanding and perceptions of the environment act as a guide to involve in innovation activities (Ahmed, 1998) that provides value in organization's technical and administrative core. Therefore, innovativeness can be regarded as a cultural element that precedes the technical and administrative innovations in organizations (Leticia & Ignacio, 2007; Tushman & O'Reilly, 1997). In the light of above discussion, the following hypotheses are proposed:

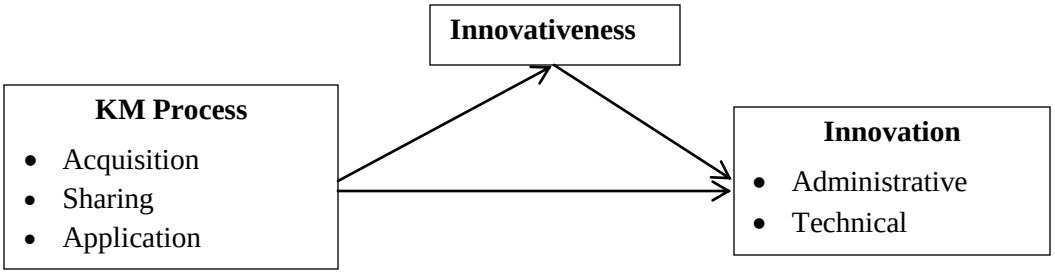
H_{3a}: Innovativeness will be positively related to administrative innovation
H_{3b}: Innovativeness will be positively related to technical innovation

As discussed previously, the study link the relationships among knowledge management processes, innovativeness and innovation types. Hypotheses 2a-2c, 3a and 3b link knowledge management processes with innovativeness and innovativeness with innovation types. In addition, knowledge management processes influence innovativeness, which in turn, have an impact on both types of innovations (i.e., administrative and technical innovations). Therefore, this study proposes that innovativeness plays a mediating role in the relationship between knowledge management processes and innovation types. Thus, it is hypothesized that:

H_{4a}: Innovativeness mediates the relationship between knowledge management processes and administrative innovation.
H_{4b}: Innovativeness mediates the relationship between knowledge management processes and technical innovation.

Overall, this paper proposes a model (see Fig. 1) that extends the initial model and states that innovativeness mediates the relationship between knowledge management processes and innovation types.

Figure 1: The research model of the study



3. Research Methodology

3.1 Data Collection and Sample

This study employs a questionnaire survey approach to collect data to test inferred hypotheses empirically. Variables in the questionnaire include knowledge management processes, innovativeness and innovation types. The participants of the study were executives and employees who work in industrial enterprises in service (i.e. banking, insurance, health care), and high-tech sectors (i.e. electronics and communications, information system, computers and office equipment and automotive) in Turkey.

At the beginning of the data collection period, the questionnaire was posted on a website. A total of 300 questionnaire links were mailed to the participants accessed through personal networks with a request for the questionnaires to be fully completed. Of the total 135 questionnaires returned, 103 were complete. The usable response rate was 76.2%. The characteristics of the sample are presented in Table 1.

Table 1:Characteristics of the sample

Characterization of the respondents (n=103)	Frequency	Percent
Gender of Respondents:		
Female	42	40.8
Male	61	59.2
Education of Respondents:		
Undergrad	47	45.6
Grad	41	39.8
PhD	15	14.6
Experience of Respondents:		
0-4 years	17	16.5
5-9 years	43	41.7
10-14 years	19	18.4
15-19 years	10	9.7
More than 20 years	14	13.6
Industry Types:		
High-tech.	53	51.5
Service	50	48.5
The Number of Employee:		
0-100	26	25.2
101-500	26	25.2
501-1000	10	9.7
More than 1000	41	39.8

3.2 Measures

In this study, 5-point Likert scale anchored by “strongly disagree” and “strongly agree” is used. Dimensions of innovativeness are measured with thirteen items and are adapted from Wang and Ahmed (2004) and Jansen et al. (2006).

Furthermore, knowledge management process is assessed with thirteen items adapted from the concept of Gold et al. (2001), Lin and Lee (2005), Chen and Huang (2009) and Huang and Li (2009). In this study, knowledge management processes is measured as three constructs including knowledge acquisition, sharing and application. Innovation types are measured as two constructs with a total of seven items: administrative innovation and technical innovation, derived from those proposed by Huang and Li (2009) and Chen and Huang (2009).

3.3 Analysis and Results

Before analyzing the hypotheses of the study, the dimensionality of knowledge management processes and innovation measures were examined by conducting principal components of factor analysis with varimax rotation. All factor analyses were carried out using SPSS 20.0. According to Hair et al. (1998), values greater than ± 50 are necessary for practical significance. Nevertheless, sample size need to be considered when deciding on acceptable factor loadings. For the sample consisting of 103 observations, minimum acceptable factor loading is 0.51. The results support three factors of knowledge management processes with eigen values greater than 1 and explain 66% of the variance, as shown in Table 2. The KM application process includes six items, KM sharing process includes four items, and KM acquisition process includes three items.

Table 2: Results of factor analysis of KM process items

Items	Factors		
	1	2	3
Applying knowledge to solve new problems.	.849	.213	.203
Applying experiential knowledge.	.740	.241	.096
Utilizing knowledge into practical use.	.732	.252	.230
Effectively managing different sources and types of knowledge.	.645	.428	.419
Transferring organizational knowledge to employees.	.622	.442	.118
Integrating different sources and types of knowledge.	.536	.383	.402
Sharing knowledge between supervisors and subordinates.	.325	.807	.104
Sharing knowledge across units.	.317	.805	.134
Sharing knowledge among colleagues.	.327	.749	.134
Sharing knowledge among partners.	.223	.531	.276
Acquiring knowledge on developing new products/services.	.250	.198	.778
Acquiring knowledge from employees.	.349	-.006	.695
Acquiring supplier knowledge.	-.093	.481	.599

As shown Table 3, the results support two factors for innovation types that have eigenvalues greater than 1 and explain 86.4% of the variance. The administrative factor includes three items and the technical factor consists of three items.

Table 3: Results of factor analysis of innovation types

Items	Factors	
	1	2
The firm develops innovative administration in planning procedures.	.887	.369
The firm develops innovative administration in process control systems.	.885	.354
The firm develops innovative administration in integrated mechanisms.	.872	.332
The firm enhances the development of new technologies.	.254	.913
The firm incorporates technologies into new products.	.383	.827
The firm facilitates new processes to improve quality and lower cost.	.468	.730

3.4 Reliability and Validity

In the study, measurement quality of the constructs was assessed by examining the convergent validity, discriminant validity, internal consistency of the items, and composite reliability (Barclay *et al.*, 1995; Chin 1998; Gefen*et al.*, 2000; Gefen&Straub 2005). The Smart-PLS software package (version 2.0) (Ringle*et al.*, 2005) was used for the assessment of measurement validity and reliability. Cronbach's alpha reliability coefficient normally ranges between 0 and 1. The closer Cronbach's alpha coefficient is to 1.0 the greater the internal consistency of the items in the scale.

Additionally, construct reliability was assessed by using composite reliability analysis as suggested by Fornell and Larcker (1981). All constructs produced satisfactory values for internal consistency of the items while the majority of the constructs exceeded 0.7 in terms of Cronbach's alpha (see Table 4), except knowledge acquisition process (0.63). As shown in Table 4, all composite reliability values were above the recommended level of 0.70 (Hair *et al.*, 1998, Fornell & Larcker, 1981). Thus, we concluded that measures utilized in the study demonstrate reliability of the scale.

The convergent validity of scales was assessed by using Smart PLS 2.0. The average variance extracted (AVE), measuring the variance captured by the indicators in relation to the variance caused by measurement error of the indicators, need to exceed .50 (Fornell & Larcker, 1981). Since all values were acceptable, convergent validity was established. Discriminant validity across scales was also assessed by comparing the cross-loadings in constructs. For the attainment of discriminant validity, loadings of the each block of indicators should load higher for its respective construct than the other constructs (Chin, 1998). As depicted in the Appendix A, the loading of each indicator was higher for its respective construct than for any other construct. In addition, it was confirmed that each construct loads highest with its own items. Therefore, the result provides support for the distinctive validity.

Table 4: PLS composite reliability, Cronbach's alpha, AVE

Construct	AVE	Comp. Reliability	Cronbach's Alpha
Administrative Innovation	0.90	0.97	0.95
Technical Innovation	0.82	0.93	0.89
Innovativeness	0.56	0.94	0.94
KM Acquisition	0.58	0.80	0.63
KM Application	0.66	0.92	0.89
KM Sharing	0.68	0.89	0.84

3.5 Results

This study attempts to understand the relationships among knowledge management processes, organizational innovativeness and innovation types. The hypothesis testing was accomplished via the estimation of a regression equation using SPSS 20.0. Additionally, as a part of the regression analysis, multicollinearity was tested by calculating variance inflation factors (VIF) for each predictor variable. All VIFs are less than 1.5, which is below the threshold of 10.0 (Hair *et al.*, 1998). Table 5, Table 6, Table 7 and Table 8 present the results of regression analysis regarding the effects of knowledge management processes and organizational innovativeness on innovation types.

Table 5 shows results of regression analysis for the effects of knowledge management processes on innovation types. Knowledge acquisition, knowledge application, and knowledge sharing processes have positive and significant effects on administrative innovation ($p<0.001$, $p<0.001$, $p<0.001$, respectively, $R^2 =0.47$). Likewise, knowledge acquisition, knowledge application, and knowledge sharing processes have also positive and significant effects on technical innovation ($p<0.01$, $p<0.01$, $p<0.05$, respectively, $R^2 =0.19$). Accordingly, results support Hypotheses 1a to 1f.

Table 5: Regression analysis of the effects KM process on innovation types

	Administrative Innovation	Technical Innovation
KM Application	.56***	.27**
KM Sharing	.29***	.19*
KM Acquisition	.28***	.29**
R^2	. 47	.19
F	29.26***	7.63***

n=103 (two-tailed test). Standardized coefficients are reported. *p<0.05, **p<0.01, ***p<0.001

Table 6 shows results of regression analysis of the effects of knowledge management processes on organizational innovativeness. Knowledge application ($p<0.001$), knowledge sharing ($p<0.001$) and knowledge acquisition ($p<0.001$) have positive and significant for innovativeness ($R^2 =0.58$). Accordingly, results support Hypotheses 2a to 2c.

Table 6: Results of regression analysis of the effects KM processes on the innovativeness

	Innovativeness
KM Application	.52***
KM Sharing	.40***
KM Acquisition	.40***
R^2	.58
F	46.01***

n=103(two-tailed test). Standardized coefficients are reported. *p<0.05, **p<0.01, ***p<0.001.

Table 7 shows results of regression analysis regarding the effects of organizational innovativeness on administrative innovation (p<0.001, R^2 =0.59) and technical innovation (p<0.001, R^2 =0.29), which are both significant. Therefore, Hypotheses 3a and 3b are supported.

Table 7: Results of regression analysis of the effects innovativeness on innovation types

	Administrative Innovation	Technical Innovation
Innovativeness	.35***	.54***
R^2	. 59	. 29
F	53.53***	42.06***

n=103(two-tailed test). Standardized coefficients are reported. *p<0.05, **p<0.01, ***p<0.001.

Innovativeness is hypothesized to mediate knowledge management processes and innovation types. This study follows Baron and Kenny (1986) procedure to analyze the mediating effect. Full or perfect mediation is supported when the independent variable has no significant effect when the mediator is controlled, while partial mediation is indicated if the effect of the independent variable is reduced in magnitude but still significant when the mediator is controlled (Baron & Kenny 1986). The first step in the analysis was to examine the innovativeness effect on knowledge management processes. All knowledge management processes relate positively and significantly to innovativeness (see Table 6). The second step was to examine the relationship between knowledge management processes and innovation types. Three knowledge management processes have positive and significant effect on all innovation types (see Table 5). Next, the relationship between innovativeness and innovation types was examined. Innovativeness has positive and significant effect on all innovation types (see Table 7). Finally, as shown in Table 8, innovativeness significantly reduces the effects of all knowledge management processes on the dependent variables to non-significance level, except for the effect of knowledge application to administrative innovation. Thus, Hypothesis 4a, which states that innovativeness mediates the relationship between knowledge management processes and administrative innovation, is partially supported. In addition, Hypothesis 4b, which states that innovativeness mediates the relationship between knowledge management processes and technical innovation, is supported.

Table 8: Results of regression analysis for mediating effect

	Administrative Innovation	Technical Innovation
KM Application	.46***	-.00
KM Sharing	.22	-.02
KM Acquisition	.21	.08
Innovativeness	.18	.52***
R^2	.48	.30
F	22.95***	10.51***

n=103(two-tailed test). Standardized coefficients are reported. *p<0.05, **p<0.01, ***p<0.001.

4. Conclusions and Limitations

The results show that knowledge management processes and organizational innovativeness significantly influence innovation types (i.e., administrative and technical). The results also indicate that knowledge management processes relate positively to innovativeness, which in turn increases innovation in organizations. The findings support the partial mediation effect of organizational innovativeness between knowledge management processes and administrative innovation.

Additionally, innovativeness fully mediates the relationship between knowledge management processes and technical innovation. In today' business environment, which is characterized by rapid and continuous changes, empirically analyzing knowledge management, innovativeness and innovation concepts is critical because of the importance of these concepts in creating competitive advantages. Thus, in this study, the importance of knowledge management processes, innovativeness, and multidimensional approach to innovation, including administrative and technical innovation, is demonstrated. In addition, the study contributes to the literature by empirically analyzing the relationship between knowledge management processes, innovativeness, and innovation types. Through managing knowledge effectively, organizations can promote not only the development of organizational innovativeness, but also enhancing all types of innovation. Therefore, knowledge management processes (i.e., knowledge acquisition, sharing, and application) have been considered effective means of promoting an innovative culture and facilitating different types of innovation in organizations. Additionally, full mediation shows the importance of innovativeness in explaining the relation between knowledge management processes and technical innovation, thus there is no need to test for further indirect effects.

Though majority of the previous studies link knowledge management with innovation in general or a single type of innovation, distinguishing innovation types is also important as successful generation, implementation, and adaptation of innovation necessitate different attributes. Therefore, one of the practical implications of the results is in the management of organizational innovation processes, owners and/or managers need to consider the types of innovation. Furthermore, in order to manage innovation process effectively, owners and/or managers need to understand knowledge management and innovativeness factors that affect different innovation types in their organizations.

Although explained patterns of relationships conform to theoretical predictions and have some practical implications, this study is not without limitations. First, knowledge management processes, organizational innovativeness, and innovation types are measured by individuals' responses that may decrease the objectivity of the study. To alleviate this limitation, samples have been chosen from executives and employees who are familiar with the topics in survey. Second, the study has been administered in a Turkish context. The proposed relationships should be examined in different cultures to increase the generalizability of the findings. In addition, according to Preacher and Kelley (2011), full mediation suggests that a researcher has completely explained the process by the relationship between independent and dependent variables and there is no need to test for further indirect effects. In the case of partial mediation effect of organizational innovativeness between knowledge management processes and administrative innovation, other indirect effects should be examined and tested empirically. Finally, the study should be repeated with an increased sample size and in a wider range of sectors.

References

Ahmed, P. K. (1998). Culture and climate for innovation. *European journal of innovation management*, *1*(1), 30-43.

Alavi, M., & Leidner, D. E. (2001). Review: Knowledge management and knowledge management systems: Conceptual foundations and research issues. *MIS quarterly*, 107-136.

Alavi, M., &Tiwana, A. (2002). Knowledge integration in virtual teams: The potential role of KMS. *Journal of the American Society for Information Science and Technology*, *53*(12), 1029-1037.

Antonelli, C. (1999). The evolution of the industrial organisation of the production of knowledge. *Cambridge Journal of Economics*, *23*(2), 243-260.

Argote, L., McEvily, B., & Reagans, R. (2003). Managing knowledge in organizations: An integrative framework and review of emerging themes. *Management science*, *49*(4), 571-582.

Barclay, D., Higgins, C., & Thompson, R. (1995). The partial least squares (PLS) approach to causal modelling: personal computer adoption and use as an illustration. *Technology studies*, *2*(2), 285-309.

Baron, R. M., & Kenny, D. A. (1986). The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of personality and social psychology*, *51*(6), 1173.

Beijerse, R. P. (1999). Questions in knowledge management: defining and conceptualizing a phenomenon. *Journal of Knowledge Management*, *3*(2), 94-110.

Bhatt, G. D. (2001). Knowledge management in organizations: examining the interaction between technologies, techniques, and people. *Journal of knowledge management*, *5*(1), 68-75.

Byrd, T. A., & Turner, D. E. (2001).An exploratory examination of the relationship between flexible IT infrastructure and competitive advantage.*Information & Management*, *39*(1), 41-52.

Carneiro, A. (2000). How does knowledge management influence innovation and competitiveness? *Journal of knowledge management*, *4*(2), 87-98.

Chen, C. J., & Huang, J. W. (2009). Strategic human resource practices and innovation performance—The mediating role of knowledge management capacity. *Journal of Business Research*, *62*(1), 104-114.

Chin, W. W. (1998). Commentary: Issues and opinion on structural equation modeling. *MIS quarterly*.

Conner, K. R., &Prahalad, C. K. (1996). A resource-based theory of the firm: Knowledge versus opportunism. *Organization science*, *7*(5), 477-501.

Cooper, J. R. (1998). A multidimensional approach to the adoption of innovation.*Management Decision*, *36*(8), 493-502.

Daft, R. L. (1978). A Dual-Core Model of Organizational Innovation. *Academy of management journal*, *21*(2), 193-210.

Daft, R. L. (1982). Bureaucratic versus non bureaucratic structure and the process of innovation and change. In Bacharach, S. B. (Ed.), *Research in the Sociology of Organizations*, Greenwich, Conn.: JAI Pres.

Damanpour F and Evan, W. (1984). Organizational innovation and performance: The problem of 'Organizational Lag'. *Administrative Science Quarterly*, 29(3), 392-409.

Damanpour, F. (1987). The adoption of technological, administrative, and ancillary innovations: Impact of organizational factors. *Journal of management*, *13*(4), 675-688.

Damanpour, F. (1988).Innovation type, radicalness, and the adoption process.*Communication research*, *15*(5), 545-567.

Damanpour, F. (1991). Organizational innovation: A meta-analysis of effects of determinants and moderators. *Academy of management journal*, 555-590.

Damanpour, F., Szabat, K. A., & Evan, W. M. (1989).The relationship between types of innovation and organizational performance. *Journal of Management Studies*, *26*(6), 587-602.

Darroch, J., & McNaughton, R. (2002).Examining the link between knowledge management practices and types of innovation. *Journal of intellectual capital*,*3*(3), 210-222.

Davenport, T. H. Prusak. L.(1998). *Working knowledge: How organizations manage what they know*.

Dobni, C. B. (2008). Measuring innovation culture in organizations: The development of a generalized innovation culture construct using exploratory factor analysis. *European Journal of Innovation Management*, *11*(4), 539-559.

Dove, R. (1999).Knowledge management, response ability, and the agile enterprise. *Journal of knowledge management*, *3*(1), 18-35.

Drucker P.F. (1995). *Managing in a Time of Great Change*.Truman Talley, New York, NY.

Drucker, P.F. (1993). *Post-Capitalist Society*.Butterworth-Heineman, New York, NY.

Evan, W. M. (1966). Organizational lag. *Human organization*, *25*(1), 51-53.

Fabrizio, K. R. (2009). Absorptive capacity and the search for innovation.*Research Policy*, *38*(2), 255-267.

Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of marketing research*, 39-50.

Garcia, R., &Calantone, R. (2003). A critical look at technological innovation typology and innovativeness terminology: a literature review. *Journal of product innovation management*, *19*(2), 110-132.

Gefen, D., & Straub, D. (2005). A practical guide to factorial validity using PLS-Graph: Tutorial and annotated example. *Communications of the Association for Information Systems*, *16*, 109.

Gefen, D., Straub, D. W., & Boudreau, M. C. (2000). Structural equation modelling and regression: Guidelines for research practice.

Gloet, M., &Terziovski, M. (2004).Exploring the relationship between knowledge management practices and innovation performance. *Journal of Manufacturing Technology Management*, *15*(5), 402-409.

Gold, A. H., Malhotra, A., &Segars, A. H. (2001). Knowledge management: An organizational capabilities perspective. *Journal of management information systems*, *18*(1), 185-214.

Gopalakrishnan, S., &Damanpour, F. (1997).A review of innovation research in economics, sociology and technology management. *Omega*, *25*(1), 15-28.

Grant, R. M. (1996). Toward a knowledge-based theory of the firm. *Strategic management journal*, *17*, 109-122.

Hair Jr. JF., Anderson R.E., Tatham R.C. and Black WC. (1998). *Multivariate Data Analysis*. Upper Saddle River, NJ: Prentice-Hall.

Hall, R. (2006). A framework linking intangible resources and capabilities to sustainable competitive advantage. *Strategic management journal*, *14*(8), 607-618.

Huang, J. W., & Li, Y. H. (2009). The mediating effect of knowledge management on social interaction and innovation performance. *International Journal of Manpower*, *30*(3), 285-301.

Hurley, R. F., & Hult, G. T. M. (1998). Innovation, market orientation, and organizational learning: an integration and empirical examination. *The Journal of Marketing*, 42-54.

Jansen, J.J.P., Van Den Bosch, F.A.J., and Volberda, H.W. (2006). Exploratory innovation, exploitative innovation, and performance: Effects of organizational antecedents and environmental moderators. *Management Science*, 52(11), 1661-1674.

Johannessen, J. A., Olsen, B., & Olaisen, J. (1999). Aspects of innovation theory based on knowledge-management. *International Journal of Information Management: The Journal for Information Professionals*, *19*(2), 121-139.

Kanter, R. M. (1984). The Change Masters. New York: Simon and Schuster.

Knight, K. E. (1967). A descriptive model of the intra-firm innovation process.*The Journal of Business*, *40*(4), 478-496.

Leticia, M., & Ignacio, L. (2007). Innovativeness and organizational innovation in total quality oriented firms: The moderating role of market turbulence. *Technovation*, 27(9), 514-532.

Lin, H. F. (2007). Knowledge sharing and firm innovation capability: an empirical study. *International Journal of Manpower*, *28*(3/4), 315-332.

McElroy, M. W. (2000). Integrating complexity theory, knowledge management and organizational learning. *Journal of knowledge management*, *4*(3), 195-203.

Miller, W. (1999).Building the ultimate resource.*Management Review*, January, pp.42-45.

Muffatto, M. (1998). Corporate and individual competences: how do they match the innovation process?. *International journal of technology management*, *15*(8), 836-853.

Nonaka, I. and Takeuchi, H. (1995).*The Knowledge Creating Company*.Oxford:Oxford University Press.

Parlby, D., & Taylor, R. (2000). The power of knowledge: A business guide to knowledge management. *Online]*, *cited*.

Plessis, M. (2007). The role of knowledge management in innovation.*Journal of knowledge management*, *11*(4), 20-29.

Preacher, K. J., & Kelley, K. (2011). Effect size measures for mediation models: quantitative strategies for communicating indirect effects.*Psychological methods*, *16*(2), 93.

Ringle, C. M., Wende, S. and Will A. (2005). SmartPLS. Hamburg, Germany, (http://www.smartpls.de).

Sarin, S., & McDermott, C. (2003). The Effect of Team Leader Characteristics on Learning, Knowledge Application, and Performance of Cross-Functional New Product Development Teams. *Decision Sciences*, *34*(4), 707-739.

Subramaniam, M., &Youndt, M. A. (2005).The Influence of Intellectual Capital on the Types of Innovative Capabilities. *Academy of Management Journal*,*48*(3), 450-463.

Thompson V.A. (1965). Bureaucracy and Innovation.*Administrative Science Quarterly*, 10(1), 1-20.

Tippins, M. J., & Sohi, R. S. (2003). IT competency and firm performance: is organizational learning a missing link? *Strategic Management Journal*, *24*(8), 745-761.

Tsai, W. (2001). Knowledge transfer in intra-organizational networks: effects of network position and absorptive capacity on business unit innovation and performance. *Academy of Management Journal*, 44, 998–1004.

Tushman, M.L., O'Reilly, C.A., III. (1997). Winning Through Innovation: A Practical Guide to Leading Organizational Change and Renewal. Harvard Business School Press, Boston.

Van de Ven, A. H. (1986). Central problems in the management of innovation.*Management science*, *32*(5), 590-607.

Wang, C. L., & Ahmed, P. K. (2004). The development and validation of the organisational innovativeness construct using confirmatory factor analysis.*European Journal of Innovation Management*, *7*(4), 303-313.

Wilson, G. (2007). Knowledge, innovation and re-inventing technical assistance for development. *Progress in Development Studies*, *7*(3), 183-199.

Yli-Renko, H., Autio, E., & Sapienza, H. J. (2001). Social capital, knowledge acquisition, and knowledge exploitation in young technology-based firms.*Strategic Management Journal*, *22*(6-7), 587-613.

Zaltman, G., Duncan, R. and Holbek, J. (1973), Innovations and Organizations, Wiley, New York, NY.

Appendix A

Items Cross Loadings

	Innovation Types	Innovativeness	Knowledge Management Processes
Employees receive a lot of support from managers if they want to try new ways of doing things.	0.6252	0.7923	0.62
We tolerate individuals who do things in a different way.	0.5399	0.7298	0.56
We are willing to try new ways of doing things and seek unusual, novel solutions.	0.5249	0.7231	0.56
We encourage people to think and behave in original and novel ways.	0.5465	0.7785	0.60
In new product and service introductions, our company is often first-to-market.	0.6079	0.7878	0.60
Our new products and services are often perceived as very novel by customers.	0.5211	0.7158	0.45
We are constantly improving our business processes.	0.7373	0.7606	0.63
During the past five years, we have developed many business processes.	0.6433	0.7006	0.52
When we cannot solve a problem using conventional methods, we easily come up with new methods.	0.6072	0.8241	0.64
Our company changes production methods at a great speed in comparison with our competitors.	0.609	0.7229	0.52
In comparison with our competitors, our products' most recent marketing program is far more innovative in the market.	0.5786	0.688	0.51
In new product and service introductions, we are often at the cutting edge of technology.	0.6291	0.7013	0.52
We constantly seek unusual and novel.	0.6561	0.8203	0.58
The firm develops innovative administration in planning procedures	0.8726	0.7109	0.72
The firm develops innovative administration in process control systems	0.8955	0.7287	0.70
The firm develops innovative administration in integrated mechanisms.	0.9065	0.7012	0.69
The firm enhances the development of new technologies.	0.8364	0.6765	0.58
The firm incorporates technologies into new products.	0.7969	0.6412	0.52
The firm facilitates new processes to improve quality and lower cost.	0.836	0.6892	0.60
Knowledge is obtained from customers.	0.3675	0.3392	0.46
Knowledge is obtained from employees.	0.4148	0.448	0.55
Knowledge is shared among colleagues.	0.4391	0.5322	0.74
Knowledge is shared across the units.	0.5268	0.5283	0.76
Knowledge is shared between supervisors and subordinates.	0.4649	0.5168	0.74
Effectively managing different sources and types of knowledge.	0.7555	0.708	0.86
Utilizing knowledge into practical use.	0.6067	0.593	0.78
Applying knowledge to solve new problems.	0.6609	0.5938	0.79
Applying experiential knowledge.	0.4816	0.5307	0.73