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## Article

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## **Impact of Knowledge Management Practices on Firm Performance: Testing the Mediation Role of Innovation in the Manufacturing Sector of Pakistan**

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### **Abstract**

With the emergence of intellectual capital and knowledge management as new disciplines, organizational authors and practitioners added these constructs as possible antecedents of the innovation. In consistent with this stream of research, this study aims to find the impact of three knowledge management practices i.e. knowledge acquisition, knowledge dissemination and responsiveness to knowledge on innovation and firm performance. For this purpose, data was collected from 407 manufacturing organizations listed in Karachi Stock Exchange, representing mainly textile, FMCG, cement, petroleum, fertilizers, pesticides, chemicals, electronics, pharmaceuticals and other sectors. SPSS has been used for data analysis. Factor analysis and Cronbach's alpha confirmed the validity and reliability of the measurement scales. Similarly, correlation and regression analysis were applied to find out the relationship among independent variables (Knowledge management practices), mediating variable (innovation) and dependent variable (firm performance). The findings show positive and significant relationship among all the study variables. Specifically, innovation partially mediates the relationship between knowledge management practices and firm performance. Theoretical & managerial implications along with limitations and recommendations for future research have also been discussed in the paper.

**Keywords:** manufacturing sector, Karachi Stock Exchange, innovation, textile.

### **1. Introduction**

Manufacturing sector is playing a crucial role in the growth of the economy of Pakistan. After service and agriculture, it is the third largest sector of Pakistan. The share of manufacturing sector in GDP of Pakistan is 18.7%. Manufacturing sector of Pakistan posted a growth rate of 3.56% during the fiscal year 2011-2012 with investments reaching Rs. 1485.0 billion. Industrial Policy 2012 of Pakistan claims at least 8% annual

growth and more than 100% value addition in manufacturing sector (Ministry of Finance, 2012). This planned increment in value addition can only be attained with the help of innovation practices. Freeman and Soete (1997) provided that innovation is a critical element for growth of economy. The organizational researchers are of the view that innovation is the only way through which organizations can improve their performance especially in this turbulent environment due to globalization, technological changes, scarce resources and changing customers demand for better quality (Jansen, Van Den Bosch, & Volberda, 2006; Roberts & Amit, 2003). Hitt, Hoskisson, Ireland, & Harrison (1991) argue that strategic competitiveness can best be achieved by firms through developing new technologies. Therefore, the only way for a firm to gain a sustainable competitive advantage is invariably upgrade its processes and activities through innovation (Porter, 1990; Drew, 1997). Even if innovation does not get direct rewards by market, it can be used to generate dynamic capabilities to manage changes in the organization's environment (Teece, Pisano, Shuen, 1997) and to gain first-mover advantages (Lieberman & Montgomery, 1998) or react speedily to market changes (Cohen & Levinthal, 1990). The significance of innovation can also be observed in the study of Fagerberg, Mowery, & Nelson (2004) which states that innovative countries had higher levels of productivity and income than less-innovative ones. Innovation has been defined in many different perspectives by various scholars.

Innovation has been defined in different ways by different authors. Damanpour & Gopkrishnan, 2001 defined innovation as 'the acceptance of any idea or conduct related to a product, service, system, device, policy or program that is new to the adopting organization'. In the same context, Nohria & Gulati, 1996 defined innovation as 'the inclusion of any policy, programme, structure, process or any market or product that a manager perceives to be true'. Thompson (1965) defined innovation as 'the generation, acceptance & implementation of new ideas, products, processes or services'. Amabile, Conti, Coon, Lazenby, & Herron, 1996 put forward a brief definition of innovation which is the successful implementation of creative ideas within an organization. In short, the core of innovation is the newness of an idea that in turn improves organizational performance (Camisón-Zornoza, Lapedra-Alcamí, Segarra-Ciprés, & Boronat-Navarro, 2004). This definition provides basis for this research as the focus of this study.

Due to strategic importance of the innovation, many researchers looked from various ways to answer the critical question "what is to be done to improve innovation?" (e.g. Anderson and West, 1996; Capon et al., 1992). With the emergence of intellectual capital and knowledge management as new disciplines, many of authors and practitioners added these constructs as possible antecedents of the innovation (Dove, 1999; Carneiro, 2000). However, the knowledge should be managed effectively in order to bring innovation in the organization. The knowledge consists of data, information and tacit knowledge and the knowledge management is function of management that creates and disseminates information and knowledge to ensure efficient and effective use of knowledge in order to achieve strategic advantage to the firm (Darroch and McNaughton, 2001). The innovation process heavily depends upon knowledge, particularly since knowledge represents a realm far deeper than simply that of data, information and conventional logic; indeed, the power of knowledge lies in its subjectivity, underlying values and assumptions that underpin the learning process (Nonaka and Takeuchi, 1995). Similarly, Gloet and

Terziovski (2004) highlighted Knowledge Management as strategic lever of innovation which ultimately improves organizational performance.

However, the empirical research focusing on the relationship between knowledge management and innovation is fragmented and piecemeal (Darroch and McNaughton, 2002). Moreover, to the best knowledge of the authors of this study, especially within Pakistan's manufacturing context, little or no attention has been given to examine the effects of knowledge management on innovation and firm's performance. There is a strong need of such kind of research in Pakistan as it is the most neglected area yet most important. Therefore, the aim of this study is to provide empirical evidence between knowledge management, innovation and financial performance in the manufacturing sector of Pakistan. The specific research questions of this study are as follows:

- a. Do Knowledge management leads to innovation in the manufacturing sector of Pakistan?
- b. Do knowledge management leads to financial performance in the manufacturing sector of Pakistan?
- c. Does innovation mediates the relationship between knowledge management and financial performance in the manufacturing sector of Pakistan?

## 2. Literature Review

The knowledge management concept has been developed as management function that seeks to create and disseminate knowledge and information. Darroch and McNaughton (2003) have highlighted three main activities of knowledge management i.e. knowledge acquisition, knowledge dissemination and responsiveness to knowledge. Knowledge management has been emerged as determinant of innovation (Carnerio, 2000; Dove, 1999). The knowledge, learning and innovation are interrelated constructs. In other words, learning takes place when knowledge is used in the organization and ultimately this learning results into creativity and innovation (Darroch and McNaughton, 2003).

In literature, effective knowledge management has been come forth as important antecedent of innovation and performance. Specifically, responsiveness to knowledge and knowledge dissemination are pivotal for creating strategic positioning such as innovation (Day, 1994). Jiménez-Jiménez & Sanz-Valle's (2011) study shows the positive relationship between organizational learning, innovation and firm performance. The study provides extra evidence to previous literature that innovation has positive effect on performance. Same content is supported by the study of Calantone, Cavusgil & Zhao (2002). The consideration shows that learning orientation has positive relationship with firm innovativeness and firm performance. Learning orientation which is related to knowledge management is essential for firm innovation capability and performance. Naidoo's (2010) study sheds light on the relationship between market orientation, marketing innovation, competitive advantage and organizational performance. The study states market orientation as an accelerator for initiation stage of marketing innovation which is positively linked with competitive advantage. Competitive advantage (achieved as differentiation, cost leadership & focus strategies) in turn positively relates with the performance of the company. Baer & Frese's (2003) study proposed that climate for initiation acts as a positive moderator between process innovation and company performance. Aragon-Correa, Garcia-Morales, & Cordon-Pozo (2007) studied the relationship between organizational learning, transformational leadership, firm innovation

& performance. The results show that the effect of organizational learning on firm innovation is more significant than of transformational leadership.

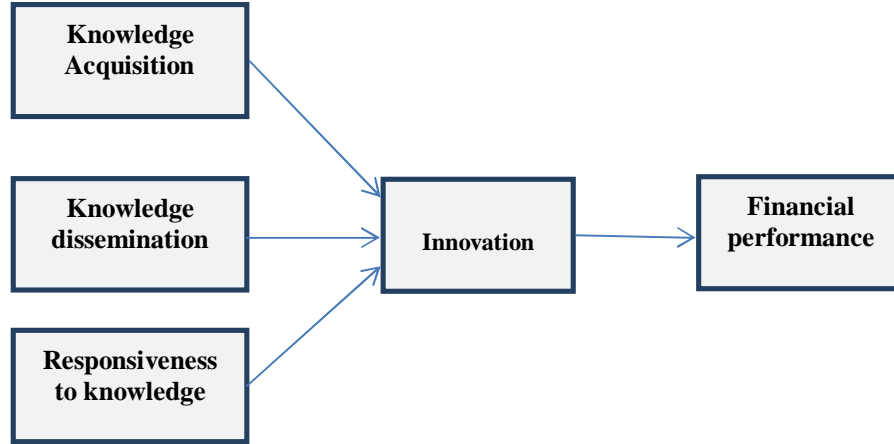
Similarly, literature provides strong evidence of the relationship between innovation and financial performance. In this research, OECD Oslo manual (2005) which is the international basis of guidelines for collecting and interpreting innovation data has been used as primary reference for the association between innovation and firm performance. Furthermore, Gopalakrishnan's (2000) study linked two dimensions of innovations (speed & magnitude) with the firm performance. The study concluded positive relationship between speed of adoption of innovations and firm performance. Damanpour, Walker & Avellaneda's (2009) study examined the outcomes of adoption of innovation types and found the positive impact of innovativeness on firm performance. Hence, concluded that cumulative adoption of innovation types over time has a positive relation with firm performance. Once again, the relationship between innovativeness and future performance has been examined by Bowen, Rostami & Steel (2010). Researchers concluded direct and significant relationship between innovation and future performance of the firm. In the same way, Subramanian & Nikalanta's (1996) study puts some additional evidence in the support of positive effect of innovation on firm performance. They analyzed the relationship between firm innovativeness, their organizational characteristics and organizational performance. Cingoz & Akdogan's (2011) recent study proposed the positive linkage of expected positive performance outcomes with innovative behavior which is considered as an important resource that leads the organization to succeed in ever-changing business environment. Sok & O'Cass's (2011) study shows the positive relationship between innovation resource-capability (R-C) complementarity and innovation based performance. Innovation-based performance is not only the result of innovation resources or innovation capability but the consequence of R-C complementarity. To line with this, Camisón & Villar-López (2012) recently over refined the relationship of two types of innovation (product & process) with firm performance. The researchers concluded positive relation of innovation capabilities with firm performance.

Although contexts of these studies vary from learning orientation, green innovation, innovation capital, trust and market orientation, however, it convey the message that organizational innovation has a positive relationship with firm performance (Gunday et al. 2011). Thus, the literature exposed above would lead us to formulate the following hypotheses:

- **H<sub>1</sub>:** Knowledge management has positive relationship with innovation
- **H<sub>2</sub>:** Innovation has positive relationship with financial performance
- **H<sub>3</sub>:** Knowledge management has positive relationship with financial performance
- **H<sub>4</sub>:** Innovation fully mediates the relationship between knowledge management and financial performance

### 3. Research Framework

As depicted in Figure-1, the following research framework has been proposed based on the above hypotheses.



**Figure 1: Research Framework**

#### **4. Data Collection and Methodology**

##### *4.1 Methodology*

Population of this study consists of manufacturing sector of Pakistan. For data collection purpose, a sample of Karachi Stock Exchange Listed firms representing twelve manufacturing sectors is selected. The companies from each sector were selected according to their proportion in total manufacturing firms listed in KSE. Hence the sample drawn is the true representative of each of nine sectors. Questionnaire, adopted from multiple studies, is used as tool for data collection. It is consisted of total 26 items to measure perceptual constructs and along with some demographic information. Total 500 questionnaires were distributed and 420 were returned out of 500 with 84% response rate. 13 questionnaires were rejected due to incomplete information. Therefore actual response rate came to be 81%. The questionnaires were filled by marketing, production, R&D and general management executives working presently in KSE listed companies. The firms represented the sample, varied in size (as measured by the number of employees, ranging from less than 250 to more than 1,000 workers); assets (less than 50 to more than 500 Million Rupees) and industry type (Textile 26.25%; FMCG 5.25, Cement 12%, Petroleum 8.25%, Fertilizers 7.25%; Pesticides 2.5%; Chemicals 9.5%; Electronics 13.0%; Pharmaceuticals 5.0%; Others 11%). Category of “others” includes plastic, footwear, accessories etc.

SPSS 17 is used in this study to analyze the collected data from manufacturing sector of Pakistan. Factor analysis and reliability analysis (Chronbach’s alpha) are used to test the validity and reliability of the questionnaire measures. Similarly, correlation and regression analysis are run to find the relationship between the variables.

##### *4.2 Measurement*

Multiple items, adopted from different studies, have been used to measure the perceptual constructs, namely: knowledge acquisition, knowledge dissemination, responsiveness to knowledge, innovation and financial performance. Specifically, knowledge acquisition, knowledge dissemination, responsiveness to knowledge was measured using scale of Darroch and McNaughton (2001). The six items of innovation was adopted from

Calantonea, Cavusgil and Zhao (2002). And similarly by following Yee, Yeung, & Cheng (2008), financial performance is measured with four items.

## 5. Data Analysis

### 5.1 Factor Analysis

#### 5.1.1. Factor Analysis of Independent Variables

Table-1 show three factor solutions of independent variables in shape of knowledge acquisition (5-items), knowledge dissemination (5-items) and responsiveness to knowledge (4-items) which together explained 65.237% of total variance. One item from each knowledge acquisition and dissemination has been excluded due to low factor loading. Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) of three independent variables is 0.818 that is acceptable and significant.

**Table 1: Factor Analysis of Independent Variables**

	Component		
	Acquisition	Dissemination	Responsiveness
K. ACQ2	.870		
K. ACQ1	.814		
K. ACQ3	.779		
K. ACQ5	.668		
K. ACQ4	.586		
K. DISS2		.852	
K. DISS4		.779	
K. DISS1		.719	
K. DISS3		.708	
K. DISS5		.533	
K. RES2			.864
K. RES1			.783
K. RES3			.776
K. RES4			.754

#### 5.1.2 Factor Analysis of Mediating Variable

Table 2 shows one factor solution of innovation in shape of 6 items, explained 48.159% of total variance. Innovation has a significant and acceptable KMO that is 0.816, as KMO greater than 0.50 is generally deemed to be significant and acceptable.

**Table 2: Factor Analysis of Mediating Variable**

	Component
	Innovation
INNOVATION5	.789
INNOVATION4	.780
INNOVATION1	.730
INNOVATION2	.685
INNOVATION3	.642
INNOVATION6	.494

### 5.1.3 Factor Analysis of Dependent Variable

Table 3 shows one factor solution of performance in shape of 4 items, explained 63.305% of total variance. Financial performance has a significant and acceptable KMO that is 0.705.

**Table 3: Factor Analysis of Dependent Variables**

	Component
	Financial Performance
PERFORMANCE2	.925
PERFORMANCE 1	.875
PERFORMANCE 3	.824
PERFORMANCE 4	.484

### 5.2 Correlation and Reliability Analysis

As the purpose of this study is to find the relationship between three dimensions of knowledge management (knowledge acquisition, knowledge dissemination, responsiveness to knowledge), innovation and financial performance, therefore correlation analysis is used to find the relationship among study variables. The results are shown in Table-4. The table shows that independent variables (knowledge acquisition, knowledge dissemination, responsiveness to knowledge), mediating variable (innovation) and dependent variable (financial performance) are significantly & positively correlated with each other. The mean, standard deviation (S.D) and value of Cronbach's alpha are also given in the table. It shows that each study variable is highly rated, as mean value of each variable is greater than three. Moreover, all the perceptual variables have acceptable value of Cronbach alpha, as shown in Table 4.



**Table 4: Correlation and Reliability Analysis**

	Mean	S.D	Alpha	PERF	INN	ACQ	DISS	RES
<b>PERF</b>	3.4220	0.94270	.796	1				
<b>INN</b>	3.7586	0.64808	.807	.376**	1			
<b>ACQ</b>	3.8872	0.70159	.855	.428**	.351**	1		
<b>DISS</b>	3.8901	0.63218	.782	.499**	.268**	.450**	1	
<b>RES</b>	3.7869	0.74671	.849	.437**	.360**	.413**	.431**	1

Note: \*\* significant at  $P < 0.05$ , S.D= Standard Deviation, PERF= Performance, INN=Innovation, ACQ= Knowledge acquisition, DISS= Knowledge dissemination, RES= Knowledge Responsiveness

### 5.3. Regression Analysis

Regression analysis has been carried out with the help of SPSS 17 to investigate the impact of three dimensions of knowledge management (knowledge acquisition, knowledge dissemination, responsiveness to knowledge on innovation and financial performance. and impact of innovation on financial performance. the results are shown in table-5, table-6 and Table-7. The results indicate that firstly, all the three dimensions of knowledge management positively and significantly stimulate financial performance ( $R^2=0.332$ ;  $F=68.186$ ;  $P < 0.01$ ). More specifically, the  $\beta$  coefficient of knowledge acquisition is 0.194, knowledge dissemination is 0.317 and responsiveness to knowledge is 0.220 which are significant as shown in Table-5. Secondly, all the dimensions of knowledge management positively and significantly leads to innovation except knowledge dissemination ( $R^2=0.176$ ;  $F=29.761$ ;  $P < 0.01$ ). More particularly, the  $\beta$  coefficients of knowledge acquisition are 0.223, knowledge dissemination is 0.064 and responsiveness to knowledge is 0.240 which are significant as shown in Table-6. Finally, innovation positively and significantly determines financial performance ( $R^2=0.14$ ;  $F=66.722$ ;  $P < 0.01$ ) with  $\beta$  coefficient 0.376. Hence,  $H_1$ ,  $H_2$  and  $H_3$  are supported.

**Table 5: Financial Performance as Dependent**

Dependent Variable	Independent Variable	Standardized Coefficients	t	Sig.	$R^2$
		Beta			
Performance	Acquisition	.194	4.111	.000	0.332
	Dissemination	.317	6.638	.000	
	Responsiveness	.220	4.712	.000	

**Table 6: Innovation as Dependent Variable**

Dependent Variable	Independent Variable	Standardized Coefficients	t	Sig.	R <sup>2</sup>
		Beta			
Innovation	Acquisition	.223	4.242	.000	0.176
	Dissemination	.064	1.213	.226	
	Responsiveness	.240	4.622	.000	

**Table 7: Performance as Dependent Variable**

Dependent Variable	Independent Variable	Standardized Coefficients	t	Sig.	R <sup>2</sup>
		Beta			
Performance	Innovation	.376	8.168	.000	0.140

#### 5.4 Mediation Analysis

Mediation analysis has been used to see the impact of independent variables (knowledge acquisition, knowledge dissemination and responsiveness to knowledge) on dependent variable (financial performance) in the presence of mediator (innovation). Method follows three steps. In first step regression was performed between independent variables (knowledge acquisition, knowledge dissemination and responsiveness to knowledge) and dependent variable (innovation) that acted as mediator. In second step regression was performed between independent variables (knowledge acquisition, knowledge dissemination and responsiveness to knowledge) and dependent variable (financial performance). In third step, regression was performed between independent variables (knowledge acquisition, knowledge dissemination and responsiveness to knowledge) and dependent variable (financial performance) in the presence of mediator variable (innovation), see Table-5 & Table-8.

As shown in Table 5, results of mediation analysis showed that independent variables are positively related to innovation in first step ( $R^2=0.176$ ;  $F=29.761$ ;  $P<0.01$ ). In second step, all the independent variables are positively related to financial performance ( $R^2=0.332$ ;  $F=68.186$ ;  $P<0.01$ ). More specifically, the  $\beta$  coefficients of knowledge acquisition are 0.194, knowledge dissemination is 0.317 and responsiveness to knowledge is 0.220 which are significant as shown in Table-8. Lastly, in the presence of innovation, relationship between knowledge management and financial performance is still positive and significant ( $R^2=0.356$ ;  $F=57.049$ ;  $P<0.01$ ) but the value of  $\beta$ -coefficient (knowledge acquisition= 0.155, knowledge dissemination= 0.305 and responsiveness to knowledge = 0.178) and t- value (knowledge acquisition= 3.268, knowledge dissemination= 6.506 and responsiveness to knowledge = 3.778) have decreased due to mediator variable (innovation). Therefore, innovation partially mediates the relationship between knowledge management and financial performance. Therefore H4 is partially supported.

**Table 8: Mediation Analysis**

Dependent Variable	Independent Variables	Standardized Coefficients	t	Sig.	R <sup>2</sup>
		Beta			
Performance	Acquisition	.194	4.111	.000	0.332
	Dissemination	.317	6.638	.000	
	Responsiveness	.220	4.712	.000	
Performance	Acquisition	.155	3.268	.001	0.356
	Dissemination	.305	6.506	.000	
	Responsiveness	.178	3.778	.000	
	Innovation	.176	4.000	.000	

## 6. Discussion and Conclusion

The present study has examined the relationships among knowledge management dimensions (knowledge acquisition, knowledge dissemination, responsiveness to knowledge), innovation and financial performance. It has been seen by the results that all the three dimensions of knowledge management (knowledge acquisition, knowledge dissemination, responsiveness to knowledge), leads to innovation and financial performance significantly. Moreover, the findings show the positive and significant relationship between innovation and financial performance in the manufacturing sector of Pakistan.

The study suggests that knowledge is pivotal for innovation, which in turn enhances the organizational performance. The organizations managing knowledge more effectively gain competitive position in the turbulent environment. Effective knowledge management helps the organization to become innovative organizations. Firms gain competitive advantage and first mover advantage through innovation, thus improves performance of organization. The innovation process depends heavily on knowledge, and the knowledge management should be an essential element of running any type of organization.

Knowledge management is essential for survival in the competitive environment, as the organizations are forced to innovate in order to compete. This study suggests that organizations should focus on knowledge management dimensions such as knowledge acquisition, knowledge dissemination and responsiveness to knowledge to improve performance.

## 7. Contribution of the Study

The findings of this study contribute in literature by providing first empirical evidence of the relationship among knowledge management practices, innovation and firm performance in Pakistani context, especially from the manufacturing sector of Pakistan. Moreover, according to the best knowledge of the authors of this study, this study provides first empirical evidence of the mediation of innovation in the relationship between knowledge management and firm performance.

## 8. Managerial Implications

The current study provides valuable information to the managers of the manufacturing sector for accelerating innovation and performance level. This study suggests that the knowledge should be managed effectively in order to bring innovation in the organization. Moreover, the innovation is prerequisite of firm performance in this dynamic environment. Managers should focus on knowledge management practices, such as knowledge acquisition, knowledge dissemination and responsiveness to knowledge, in order to improve the innovation and performance of the organization.

## 9. Limitations and Recommendations for Future Research

The limitations of this study would become focus for future research. It is a cross sectional study where all data were collected at a particular time, so variables and analysis is restricted to that particular time. Also, this study is limited to only manufacturing sector of Pakistan, further studies may focus on other sectors of Pakistan and other geographical locations. Another limitation of study is that this study did not consider the impact of size, there is need of comparative study on the basis of size.

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