

Laeque, Syed Harris; Babar, Samreen Fahim

## Article

# Knowledge creation and firm performance: Is innovation the missing link?

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## **Knowledge Creation and Firm Performance: Is Innovation the Missing Link?**

Syed Harris Laeeque (Corresponding author)

Department of Management Sciences, Bahria University Islamabad, Pakistan  
Email: harrislaeeque@hotmail.com

Samreen Fahim Babar

Department of Management Sciences, Bahria University Islamabad, Pakistan  
Email: samreenbabar@hotmail.com

### **Abstract**

This research analyzes the interrelationship among knowledge creation, innovation and firm performance using 350 surveys distributed to middle managers of three Pakistani telecommunication companies. The statistical results confirm the direct association between both knowledge creation and firm performance, and innovation and firm performance. Furthermore, results highlight a potential mechanism for the impact of knowledge creation on firm performance: the partial mediating role of innovation. Results not only present insights to address the question of what drives firm performance, but also contribute to integrate the literature on knowledge management and innovation management. The study advises practitioners to focus on learning-conducive cultures, flexible structures and learning-supportive leadership as strategies to effectively leverage organizational innovation and knowledge creation capacity.

**Keywords:** knowledge creation, innovation, firm performance, telecommunication, Pakistan.

### **1. Introduction**

Firms possess various resources of different nature, but knowledge-based resources are among the main ones that are imperative to strategic competitive advantage. In the present organizational setting, rapidly changing environmental demands and quick imitation by competitors make it essential for even market-dominant companies to continuously generate new knowledge (Kraaijenbrink et al., 2010; Lin & Wu, 2014). Therefore, organizations have gradually started to depend more on building and creating knowledge as an indispensable precondition to survive and thrive in their respective hyper-competitive marketplace (Wang et al., 2011). Organizations create new knowledge within their physical boundaries as well as from outside so as to prevent rigidity, encourage inventive serendipity, and assess their technological competency against that of competitors (Szulanski, 2001; Easterby-Smith & Lyles, 2011). Influenced by the growing recognition of the significance of knowledge creation, Nonaka (1994) put forward a dynamic a theory of organizational knowledge which addresses the continual interaction between explicit and tacit knowledge to develop new organizational knowledge. As per Nonaka, knowledge creation is a firm's capacity to produce new

varieties of knowledge, spread it all over the firm, and reflect it in systems, services and products. Nonaka's theory has two perspectives: static and dynamic. The static perspective explains how can the existing knowledge be replicated and exploited to influence organizational outcomes, while the dynamic perspective focuses on how new knowledge can lead to the development of novel organizational outcomes. Nonaka contends that though individuals are of utmost importance to new knowledge creation, organization as a whole contributes significantly to amplify and formulate that knowledge (Nonaka, 1994).

In recent years, knowledge creation has become a topic of great significance for any organization of the world (Hunt & Arnett, 2006). Knowledge has widely been recognized as a crucial strategic resource for the enhancement of innovation and improvement of firm performance (Du Plessis, 2007; Alegre et al., 2013). In spite of knowledge being labelled as the basic asset for organizational development, there is still not much agreement on the appropriate methods to implement and leverage the knowledge creation process (Easterby-Smith & Lyles, 2011; Nakamori, 2011). That is, most practitioners are unaware of the mechanism through which knowledge creation process can result in improvement of organizational effectiveness, competitiveness and profitability (Esterhuizen et al., 2012). However, a rapidly rising number of studies are of the opinion that knowledge creation could contribute significantly in increasing innovation and improving performance of firms (Yang, 2010; Mills & Smith, 2011; Shu et al., 2012).

Knowledge creation, innovation and firm performance are all positively associated with each other; yet, studies that empirically look into the interrelation among these constructs are still limited (Nakamori, 2011; Esterhuizen et al., 2012; Sankowska, 2013). Prior studies have largely addressed organizational innovativeness, that is to say, on the level to which an organization's culture supports and promotes innovation, or have focused only on one or two types of innovation—like, product and process innovation—when examining the innovation-firm performance relationship (Jiménez-Jiménez & Sanz-Valle, 2011). Hence, the construct of innovation has only been partially explained by the prior research. In the same way, to measure the phenomenon of knowledge creation, most studies have adopted a cultural perspective. However, only a handful studies have examined the process of knowledge creation in relation to firm performance (Hunt & Arnett, 2006; Nakamori, 2011). Since specific actions are relatively easy to change than the cultural values, it may be valuable for practitioners to focus more on the process.

Knowledge creation and innovation are well-researched concept in the West, however, in South Asia, the literature on them is still in early stages. In Pakistan's context, there are only handful studies that simultaneously address the interrelationship between the concepts of knowledge creation and innovation. Moreover, in Pakistan's telecommunication sector's setting, this interrelationship has largely been overlooked. Research on these two concepts in Pakistan's telecommunication context is important for three reasons. First, the services offered by the telecom companies in Pakistan are almost similar in terms of price and quality. If the telecom companies understand the significance of continuous knowledge creation and innovation, they can develop unique services which can give them a lasting competitive edge. Second, web-based services like Skype and Whatsapp have significantly affected the financial performance of telecom companies. These web-based apps are here to stay and companies can do nothing to stop people from using them. What the telecom companies can do is that they can come up

with such innovative offerings (e.g. 4G, 5G) that facilitate people to use the web-based apps. Third, today's customers are challenging—they have heterogeneous needs, wants and preferences. Through smart knowledge creation approaches (like brainstorming and customer/market survey), telecom companies can determine what service attributes are likely to satisfy customers and also have potential to generate streams of revenue.

This study addresses the shortcomings in prior research that has investigated the influence of knowledge creation on firm performance. The foremost objective of this study is to inquire how the creation of new knowledge affects a firm's performance level through innovation. Using knowledge creation theory of Nonaka as the theoretical angle, this study develops and tests hypotheses on the mediating effect of innovation by working on a sample of middle managerial employees from telecommunication firms of Pakistan. The study focuses on the significance of innovation in the knowledge creation-firm performance relationship by first checking the direct effect of knowledge creation upon firm performance and then, its indirect effect via innovation.

The rest of the study is arranged as follows. The second section briefly discusses the literature on knowledge creation and innovation to give an overview of these two constructs. Section three, theoretical framework, gives an account of the four hypotheses of the study. This is followed by the research methodology. The latter sections present the findings obtained from statistical analyses and their discussion, implications for practice, and the study's limitations and conclusion.

## **2. Literature Review**

### *2.1 Knowledge Creation*

Knowledge, from an organizational perspective, is the collective understanding and know-how of an organization that has been accumulated over time (Easterby-Smith & Lyles, 2011). Knowledge has several classifications, but the two most well-accepted are: tacit knowledge and explicit knowledge. The former is a personal knowledge derived from a person's past experiences, instincts and beliefs, and is communicated via metaphors, analogies and demonstration; while, the latter is a knowledge that can be communicated in proper language, like equations, figures, software codes, and sentences (Nakamori, 2011). Knowledge creation can be considered as actions and programs deliberately undertaken with the purpose of developing new objects, insights or ideas (Hunt & Arnett, 2006; Shu et al., 2012; Purcarea et al., 2013). As per Sankowska (2013), it is a method through which discontinuous and complex phenomena and events can be utilized to sort out collectively defined problems. In the absence of knowledge creation, organizations will neither be able to access new knowledge nor will be able to manage new intellectual assets. Furthermore, they will also not be able to attain or sustain their competitive advantage (Zheng & Nguyen, 2016).

This study is based on the seminal work of Nonaka and Takeuchi (1995) and their well-acknowledged SECI model of knowledge creation. This model has four modes through which the two knowledge types—tacit and explicit—interact with each other. Socialization, the first mode, triggers the organizational knowledge creation process by combining and sharing individuals' tacit knowledge to create and share new, collective tacit knowledge. Externalization, the second mode, is the practice of expressing collective tacit knowledge into explicit conceptions that can be shared and applied in the workplace. Combination, the third mode, is a process which joins disconnected components of

explicit knowledge and converts them into more systematic, logical and complex collection of explicit knowledge. Internalization, the final mode, is the practice of converting organizational explicit knowledge back into individuals' tacit knowledge to form shared mental models (Nonaka & Takeuchi, 1995; Nonaka & von Krogh, 2009; Nakamori, 2011).

Regardless of the widespread acclaim, researchers have raised some serious criticisms to Nonaka's knowledge creation theory. For example, Becerra-Fernandez and Sabherwal (2001) reject Nonaka's claim that the SECI spiral is a universal model. The authors believe that the presence of suitable task characteristics is essential for the SECI modes to function well. Poell and van der Krogt (2003) opine that contrary to what Nonaka's theory proposes, employee can also learn on their own without the support of their management. Glisby and Holden (2003) contend that the SECI model is based entirely on the cultural practices of Japan, and therefore, it may not be applicable in other cultural contexts. Egestrom (1999) notes that self-organized learning and problem finding are two important issues that the SECI model does not addresses. Jorna (1998) remarks that in Nonaka's theory, not only is the learning theory neglected but a semiotic framework is lacking. However, in spite of these criticisms, Nonaka's theory still holds strong and continues to attract attention of practitioners and scholarly community.

## 2.2 Innovation

The term innovation has a wide range of definitions coming from scholars across various disciplines. From an organizational perspective, Wang and Wang (2012) stated that innovation is to generate, accept and implement new products, services, processes or ideas. For Noruzy et al. (2013), innovation is to successfully implement original or imaginative ideas in organizations. More comprehensively, Camisón and Villar-López (2014) described innovation as the deliberate implementation or introduction of new ideas, procedures, processes or products that are designed for the betterment of the individual, group, organization, or society at large. This particular conceptualization of innovation differentiates it from creativity as it is more of a planned or intended activity. Innovation is a valuable tool that helps organizations to achieve their goals when the everyday tools and strategies fail to succeed (Khedhaouria & Jamal, 2015).

While innovation has several different types, this study focuses on the four types prescribed by OECD Oslo Manual (2005). Product innovation is introducing a product/service that is either entirely new or a considerably advanced version in terms of its functional characteristics, user friendliness, components and materials, and/or technical specifications (Polder et al., 2010; Gunday et al., 2011). Process innovation is the introduction of something new in a firm's service or production operations, like new equipment, changed task specifications, or different input materials (Polder et al., 2010). Marketing innovation is the development and application of new marketing techniques encompassing major modifications in pricing, promotion, placement, design and/or packaging strategy (OECD, 2005; Gunday et al., 2011). Organizational innovation is the introduction and application of new practices or processes for improving routine activities, managing intra- and inter-organizational relationships, enhancing decision making system, and organizing workplace (OECD, 2005).

Critics argue that innovation does not always yields desirable results, and it may have negative consequences for the innovating company. Fagerberg (2005) says that there is

no guarantee that implementing an innovation will bring about beneficial outcomes. Fagerberg further argues that around 50-90% of most innovation projects make no or little contribution to the innovating organization's goals and strategies. Innovations usually fail not because they are bad ideas but because of poor leadership, lack of skills, budgetary constraints, lack of motivation and commitment, and lack of knowledge. The impact of failed innovation goes beyond the simple monetary loss. Failure of innovation may lead to an increase in employees' cynicism, reluctance to innovate in future, and loss of employees' and organization's morale (Simpson et al., 2006). Scholars like Haynes et al. (2011) and Pesämaa et al. (2013) debate that innovation often burdens employees, necessitates high and risky investments, creates uncertainty and confusion, and requires great trade-offs. Regardless of such arguments, the fact that "innovation is the heart of an organization's competitive advantage" cannot be denied. Organizations are therefore advised to take calculated risks, and responsibly experiment with new ideas and concepts.

### **3. Theoretical Framework and Hypotheses Development**

#### *3.1 Knowledge Creation and Firm Performance*

The resource advantage theory and its proponents consider knowledge as an indispensable, strategic asset of organizations (Hunt & Arnett, 2006; Mills & Smith, 2011). Knowledge is a valuable resource that has the characteristics of immobility, uniqueness and heterogeneity (Nakamori, 2011; Yang, 2010). Therefore, the capacity to generate, integrate and apply knowledge facilitates organizations to enhance their distinctive competencies, competitive position and economic performance, and achieve sustainable competitive advantages (Easterby-Smith & Lyles, 2011; Shu et al., 2012).

With ample evidence, prior studies have suggested that knowledge creation plays a central role in the success or failure of an enterprise (Du Plessis, 2007; Nakamori, 2011; Sankowska, 2013). Firms that implement knowledge creation processes effectively are better able to link knowledge in new and unique manners, and produce novel and innovative goods and services to create value for customers (Nonaka & Takeuchi, 1995; Schulze & Hoegl, 2006). Kuo (2011) noted that certain learning-climate related factors enable the knowledge creation process which, in turn, helps the organization to achieve greater competitiveness, effectiveness and performance. Likewise, Liao and Wu (2010) empirically vindicated how effective adoption of knowledge creation practices positively effects various performance-related outcomes of manufacturing companies. His study revealed that companies that take part in knowledge creation practices perform financially, operationally and socially better than firms that ignore them. Knowledge-creation systems and practices create new process knowledge and thus, are influential in achieving superior, competitive firm performance (Nonaka & von Krogh, 2009; Alegre et al., 2013). Hence, it is concluded that literature supports the idea that knowledge creation positively contributes to the performance and success of a firm in the long run. For the present study, this relationship is hypothesized as:

- **H<sub>1</sub>:** Knowledge creation positively influences firm performance

#### *3.2 Knowledge Creation and Innovation*

The fact that knowledge facilitates innovation in organizations has been well-established in literature (Quintane et al., 2011; Purcarea et al., 2013). However, only recently have the researchers started to address the role of knowledge creation in encouraging organizational innovation (Nakamori, 2011). Researchers from various disciplines have

recognized knowledge as a critical prerequisite for creativity, innovativeness and innovation (Nonaka & von Krogh, 2009; Yang, 2010). A firm's capacity to innovate is highly contingent on the creation of new knowledge (Esterhuizen et al., 2012). Knowledge creating activities transform general knowledge into specific knowledge, which results in the development of new processes, goods and services (Nonaka & Takeuchi, 1995; Mills & Smith, 2011). Knowledge creation process provides easier and quicker access to unique insights and philosophies that expand creativity envelop and enhance innovation process (Schulze & Hoegl, 2006; Easterby-Smith & Lyles, 2011; Nakamori, 2011).

Alegre et al., (2013) posited that knowledge creation process facilitates employees to internally and externally acquire knowledge, and to combine it with the current knowledge to create new stocks of knowledge. The new knowledge stocks expand the depth and breadth of already existing organizational knowledge, and thereby increase the capacity to create innovative processes, goods and services. Shu et al., (2012) asserted that knowledge creation process generates synergistic benefits and collective learning during the course of knowledge exchange and internalization. This, in consequence, produces novel products and process improvements. Quintane et al. (2011) also contended that knowledge creation process enables the combination and application of specialized knowledge from different functional areas. This can reduce redundancy, improve process efficiency, and accelerate the speed of new product development. Sankowska (2013) stated that firms which implement knowledge creation strategy are more likely to achieve innovation and process improvements. Hence, considering this discussion, the relationship between knowledge creation and innovation is hypothesized as:

➤ **H<sub>2</sub>:** Knowledge creation positively influences innovation

### 3.3 *Innovation and Firm Performance*

Schumpeter (1934), in his classical study, established the association between a firm's level of innovation and its overall performance. Schumpeter opined that when a firm introduces novel and innovative goods for the first time, it encounters little direct competition in the market and therefore, reaps comparatively higher profits on every sale. Over the course of time, competition and imitation may result in the erosion of these high profits; however, firms that keep on producing innovative goods are likely to sustain high profitability for a considerable period of time. In conformance with this theory, Wang and Wang (2012) postulated that achieving performance improvement and competitive position are the ultimate reasons for organizations to take part in innovational activities. This association between innovation and firm performance has been explored extensively from a variety of angles and there is no dearth of research in this domain (Gunday et al., 2011; Camisón & Villar-López, 2014).

Many scholars have put forward that innovative organizations experience growth in their profitability and market value (Jiménez-Jiménez & Sanz-Valle, 2011; Noruzy et al., 2013). Innovation in organizations affects their quality, quantity and variety of goods and services, and may consecutively enhance their performance (OECD, 2005; Purcarea et al., 2013). Camisón and Villar-López (2014) investigated how firm performance is affected by the frequency of new product introduction and found a positive association between the two variables. Similarly, Hung et al. (2011) stressed that when firms involve

themselves in innovational activities, their overall performance gets better. The work of Jiménez-Jiménez and Sanz-Valle (2011) advocated that service sector organizations oriented towards innovation are expected to show superior levels of firm performance. In the same way, different studies have gathered evidence from diverse industries and have proposed that innovation is an essential tool for attaining a competitive edge and realizing lasting success and prosperity (Polder et al., 2010; Gunday et al., 2011). Hence, this discussion leads to the following hypothesis of the study:

- **H<sub>3</sub>:** Innovation positively influences firm performance

#### *3.4 Mediating Role of Innovation*

Several studies have confirmed that knowledge creation influences firm performance positively (Yang, 2010; Kuo, 2011). Similarly, a seemingly an infinite number of studies have examined the role of innovation in influencing organizational performance-related outcomes (Jiménez-Jiménez & Sanz-Valle, 2011; Hung et al., 2011). However, to date, the concepts of knowledge creation, innovation and firm performance have hardly been examined together in a single study. While few studies have addressed the relationship between knowledge creation and innovation (Pezzillo Iacono et al., 2012; Esterhuizen et al., 2012), none has ever tried look into the mediating effects of innovation on the relationship between knowledge creation and firm performance.

Research has shown that knowledge creation provides the required raw material for innovation in the form of unique information, new understandings, diverse viewpoints, improved creativity, teamwork, collaborations with third parties, and continuous learning (Quintane et al., 2011; Sankowska, 2013). When firms lack these elements, efforts to carry out innovation are hindered and, as a result of this, improvement of performance and achievement of strategic advantage also becomes difficult (Nonaka & Takeuchi, 1995; Du Plessis, 2007). Hence, based on this argument, it is suggested that innovation plays a mediating role in the relationship between knowledge creation and firm performance. This mediating relationship is further hypothesized as:

- **H<sub>4</sub>:** Innovation mediates the relationship between knowledge creation and firm performance

#### **4. Methodology**

Using a self-report cross-sectional survey methodology, this study was performed at the Islamabad head offices of three telecommunication firms of Pakistan (see appendix). It was initially planned to collect data from a randomly selected sample that represents all organizational departments. However, the administration of telecom companies did not permit the researchers to go to each floor and department; only access to certain departments was given, and that too, for a limited number of hours. Hence, the researchers opted for convenience sampling method to recruit a sample of 350 employees from the middle management who had at least one year service in their current firm. The selected participants were first briefed about the study's objective and scope, and the data's nature and use. They were guaranteed that their identities would be protected and the filled questionnaires would not be shown to the management. Two research assistants distributed questionnaires in sealed envelopes to participants after getting consent from them in written. After three hours and one reminder, 264 questionnaires were collected back, yielding a 75% response rate. Of these questionnaires, 27 were partially filled and 17 were filled inappropriately, thus leaving only 220 questionnaires that could be used for



statistical analyses. Roscoe (1975) states that for most management science research, a sample size greater than 50 is sufficient enough to generalize results. Hair et al. (2010) find no particular relationship between the number of elements in a population under study and the number of respondents needed for sample. This insinuates that a sample as low as 200 will be good enough for a population of 1,000,000. Hence, this study's 220 useable questionnaires are considered as adequate to proceed to data analysis.

Most employees who participated in the study were men (80%) in assistant manager's position (51%) with a Master's degree (87%). They were mostly married (83%), in their 30's ( $\pm 7.67$  years), represented the finance department (32%), and had around 6.58 years ( $\pm 4.36$ ) of corporate experience.

This study used a 48-item, Likert scale-based questionnaire whose options ranged from "strongly disagree" (1) to "strongly agree" (5). Knowledge creation was assessed through four scales adapted from Schulze and Hoegl's (2006) study; each scale consisted of four items. Similarly, innovation was assessed through four scales adapted from Gunday et al.'s (2011) work; each scale consisted of five items. Finally, firm's perceived financial and non-financial performance was assessed through two self-developed scales consisting of total twelve items. The goodness-of-fit statistics of each construct are presented below (see table 1). The eminent research methodologist like Wheaton et al. (1977), Bollen, (1989) and Hoyle (1995) recommend the following cut-offs for the goodness-of-fit indices:  $RMSEA \leq .10$ ,  $CFI \leq .90$ ,  $GFI \leq .90$ ,  $NFI \leq .90$ ,  $NNFI \leq .90$ , and  $RMR \leq .10$ . Hence, keeping these traditional cut-off values in consideration, it was confirmed that all the three measurement scales used in this study were valid as their fit indices were well-within their recommended threshold.

**Table 1: Goodness-of-Fit Statistics of Latent Variables**

Variable	$\chi^2$	df	$p$	RMSEA	CFI	GFI	NFI	NNFI	RMR
<b>Knowledge Creation</b>	123.45	49	<.01	.10	.95	.93	.94	.95	.068
<b>Innovation</b>	95.26	28	<.01	.08	.96	.92	.94	.94	.055
<b>Firm Performance</b>	148.61	56	<.01	.07	.93	.88	.89	.90	.038

To check the internal consistency of measurement scales, Cronbach's alpha and composite reliability were used as reliability indicators. Cronbach's alpha is a tool used to determine whether or not all indicator items of a latent construct behave similarly. An alpha coefficient greater than .69 is an indicative of error-free selection of the items hypothesized to measure a construct (Hair et al., 2010). On the other hand, composite reliability is a test used to determine how well a latent construct can be quantitatively measured by its respective indicator items (Zikmund, 2003). A composite reliability greater than .5 indicates that at least 50% of the variance in a measurement is captured by the trait variance and that the variance captured by the measures is greater than the one captured by the errors (Bagozzi et al., 1991). In the present study, each scale had coefficient alpha well above .70 and composite reliability also greatly exceeded .50; thus indicating high internal consistency of all measures. To determine convergent validity, the AVE (Average Variance Explained) of each variable was calculated. AVE—a conservative determinant of convergent validity—is a statistic that measures the percentage of average variance a theoretical construct explains in its indicators. It is

calculated by taking an average of the squared factor loading of items (Hair et al., 2010). An AVE value that equates or exceeds .50 is an adequate representative of a construct's convergent validity as it shows that the latent factor explains more amount of overall variance in its items in comparison to the measurement error (Fornell & Larcker, 1981). In this study, as the minimum obtained AVE value of the constructs was .60, convergent validity was confirmed (see table 2).

**Table 2: Internal Consistency and Validity of Scales**

Variable	Standardized Loading of Item						$\alpha$		CR	AVE
	1	2	3	4	5	6				
Socialization	.83	.82	.82	.80			.82	.83	.75	.66
Externalization	.87	.88	.79	.78			.84		.77	.69
Combination	.84	.85	.90	.86			.87		.80	.74
Internalization	.82	.77	.85	.85			.83		.76	.67
Product Innovation	.90	.92	.91	.86	.85		.89	.86	.81	.78
Process Innovation	.72	.92	.79	.90	.87		.85		.79	.71
Market Innovation	.80	.86	.90	.89	.81		.86		.79	.72
Organizational Innovation	.89	.88	.86	.91	.84		.88		.80	.76
Financial Performance	.82	.79	.71	.76	.78	.88	.80	.78	.78	.62
Non-Financial Performance	.77	.79	.72	.79	.80	.79	.78		.78	.60

Lastly, to ascertain the discriminant validity, chi-square difference test was run. Chi-square difference test is an important statistical technique that can be used both to make complex models simpler and simpler models complex. This test helps to determine whether or not the fit of a structural model worsens significantly when model restrictions are enforced (Hox et al., 2010). The chi-square difference test of this study revealed that the difference between the independent model (M1) and fully mediated model (M2) was statistically significant and favored M2. In addition, the difference between M2 and the partially mediated model (M3) was also significant, and was in favor of M3. In comparison, M3 was the best fitting model as its chi-square, degree of freedom and AIC value was the lowest. This test provided initial support to the partial mediating role of innovation in the knowledge creation—firm performance relationship (see table 3).

**Table 3: Chi-Square Difference Test**

Models	$\chi^2$	df	$p$	RMSEA	NFI	TLI	IFI	AIC	$\Delta\chi^2$	$\Delta df$	$\Delta AIC$
M <sub>1</sub>	306.06	68	<.01	.40	.01	.00	.00	399.08			
M <sub>2</sub>	112.67	20	<.01	.02	.97	1.05	1.04	218.67			
$\Delta M_1-M_2$									193.39	48	180.41
M <sub>3</sub>	109.85	19	<.01	.02	.98	1.06	1.04	204.14			
$\Delta M_3-M_2$									2.82	1	14.53

## 5. Results

### 5.1 Initial Analyses

Before hypotheses testing, the two major issues related to the study's research design were addressed. First, to address the issue of common-method bias arising from use of self-reported measures for data collection, Harman one-factor test was conducted. Factor analysis performed on items for each of the three constructs extracted 10 different factors instead of a single factor. Furthermore, the eigenvalues of all extracted factors exceeded 1.0, with the largest factor accounting for only 19% of variance and the 10 factors

cumulatively accounting for 67% of the total variance. Thus, it was concluded that common-method bias was not a major issue in the dataset.

Second, to address the issue of multicollinearity—when multiple variables have strong linear relationships—the study ran collinearity diagnostics. The findings exhibited that the VIF (variance inflation factor) values of the hypothesized model were much less than 10, with mean VIF value less than 2.93 and tolerance statistic above .2. Thus, the dataset was free from the multicollinearity issue.

### 5.2 Hypotheses Testing

In the first phase of hypotheses testing, the commonly used multivariate statistical analysis technique of correlation analysis was used. Correlation analysis is a forecasting technique used to determine whether or not two variables linearly co-vary (Neuman, 2006). In other words, it measures that to what extent variation in one of the study variables is associated with variation in other variable/s. Correlation analysis also shows the direction and magnitude of the relationship between two variables, and the probability that the relationship between them is not just by chance (Zikmund, 2003). The correlation matrix of this study (see table 3) indicated that the four modes of knowledge creation process and the four types of innovation are significantly and positively related with each other. Particularly, combination mode and product innovation have significant inter-correlation ( $r = .38$ ;  $p < .01$ ). Likewise, the knowledge creation modes and the two types of firm performance have major correlations. The coefficient for externalization mode and non-financial performance is positive and statistically significant ( $r = .30$ ;  $p < .01$ ). Furthermore, the types of innovation and firm performance are considerably interrelated with each other. Especially, product innovation and financial performance have a significant relationship ( $r = .37$ ;  $p < .01$ ). This correlation analysis provided support to the nomological validity of the three constructs of the study.

**Table 3: Correlation Analysis**

Variable	Mean	SD	1	2	3	4	5	6	7	8	9
1. Socialization	3.55	.59	—								
2. Externalization	3.31	.60	.51**	—							
3. Combination	3.44	.53	.39**	.47**	—						
4. Internalization	3.40	.56	.33**	.38**	.45**	—					
5. Product Innovation	3.12	.60	.28**	.32**	.38**	.32**	—				
6. Process Innovation	3.15	.64	.19**	.28**	.34**	.27**	.49**	—			
7. Market Innovation	3.36	.67	.26**	.24**	.20**	.28**	.32**	.29**	—		
8. Organizational Innovation	3.43	.53	.30**	.22**	.28**	.29**	.28**	.31**	.51**	—	
9. Financial Performance	3.50	.58	.26**	.21**	.23**	.33**	.37**	.23**	.18**	.41**	—
10. Non-Financial Performance	3.26	.54	.27**	.30**	.13**	.24**	.20**	.25**	.34**	.26**	.21**

Note. \*\*  $p < .01$

In the second phase of hypotheses testing, Structural Equation Modelling (SEM) analysis was conducted through AMOS software in order to evaluate the structural model. SEM is a powerful analytical approach used to determine whether or not the collected data is

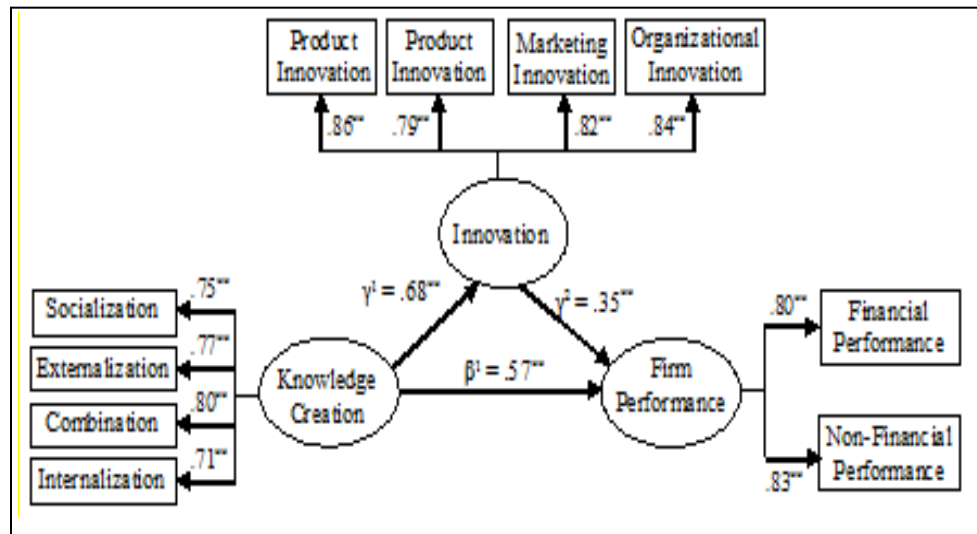
consistent with the proposed theoretical model (Hox et al., 2010). SEM examines the correlations and causations among the observed and latent variables, and is therefore, the finest technique to clarify and verify the observed as well as hidden patterns of the dataset (Glembocki, 2013). Results of this study's SEM analysis showed that combination is the most essential mode of knowledge creation process ( $\lambda^{x3} = .80$ ). This indicates that knowledge creation process is more likely to yield performance-based outcomes in firms where employees continually exchange and integrate knowledge via different media (like telephonic conversations, meetings and documents), and reconfigure existing knowledge by categorizing, combining, adding, or sorting it. Similarly, product innovation is the primary factor affecting the overall innovation of a firm ( $\lambda^{y1} = .86$ ). This signifies that developing and commercializing new products to create value and cater the needs of existing customers or new markets, can add to the overall innovation performance. Besides, the results exhibit that financial performance is the most significant performance type of a firm ( $\lambda^{z1} = .88$ ).

The causal interrelationships among the three variables were also examined through the meta-analytical SEM method. SEM—which is an extension of multiple regression—assesses the interrelationship among a set of correlated, multi-dimensional scales (Hair et al., 2010). Results drawn through SEM suggested that knowledge creation is a key predictor of innovation ( $\gamma^1 = .76$ ;  $p < .01$ ) and this result was consistent with the findings of Binbin et al. (2012), Lyles (2014) and Berraies and Chaheer (2014). Similarly, innovation was also found to be a major determinant of organizational performance improvement ( $\gamma^2 = .35$ ;  $p < .01$ ), and this particular result was in line with the findings of Jiménez-Jiménez and Sanz-Valle (2011), López-Nicolás and Meroño-Cerdán (2011) and Alegre and Chiva (2013). Besides it was found that knowledge creation has a considerable direct influence on firm performance ( $\beta^1 = .57$ ;  $p < .01$ ), and this same result was also achieved by Lien, Kuo and Ng (2014), Song (2008), and Shu et al. (2012). From the results, it is assumed that implementing knowledge creation practices produces new understandings and knowledge that act as drivers of organizational innovation capacity and performance improvement. In addition, innovation capacity translates into organizational performance enhancement by developing new or improved processes, goods and services. Hence, the hypotheses H<sub>1</sub>, H<sub>2</sub> and H<sub>3</sub> are confidently accepted on the basis of the results.

**Table 4: SEM results**

		<b>Standardized Regression Weight</b>	<b>t-value</b>
$\lambda^{x1}$	Knowledge Creation → Socialization	.75**	13.11
$\lambda^{x2}$	Knowledge Creation → Externalization	.77**	14.10
$\lambda^{x3}$	Knowledge Creation → Combination	.80**	13.19
$\lambda^{x4}$	Knowledge Creation → Internalization	.71**	12.92
$\lambda^{y1}$	Innovation → Product Innovation	.86**	8.92
$\lambda^{y2}$	Innovation → Process Innovation	.79**	11.57
$\lambda^{y3}$	Innovation → Market Innovation	.82**	9.58
$\lambda^{y4}$	Innovation → Organizational Innovation	.84**	11.32
$\lambda^{z1}$	Firm Performance → Financial Performance	.88**	6.88
$\lambda^{z2}$	Firm Performance → Non-Financial Performance	.83**	8.56

Note. \*\* $p < .01$



**Figure 1: Structural Model**

The effects in path analysis were decomposed to look into the direct and indirect relationships among the latent variables. Path decomposition analysis—which as an extension of multiple regression analysis—is an advanced methodological approach that provides deeper understanding of the proposed structural models and the strength of the hypothesized relationships. Through decomposition analysis, the conflated interrelationships are disentangled which allows researchers to disintegrate the correlations between two endogenous variables, or between endogenous and exogenous variables, into different constituents (Balding et al., 2008). Decomposition analysis of this study's causal model revealed that knowledge creation process has a significant positive effect on innovation ( $\gamma^1 = .68$ ;  $p < .01$ ) as well as on perceived firm performance ( $\beta^1 = .57$ ;  $p < .01$ ). Moreover, innovation considerably and positively contributes to firm performance ( $\gamma^2 = .35$ ;  $p < .01$ ). Besides, the results exhibited that through the mediator i.e. innovation, knowledge creation has an indirect effect of .24 ( $.68 \times .35$ ) on firm performance. A comparison of the strength of the effects of knowledge creation and innovation on firm performance suggests that since the indirect effect is less than the direct effect, hypothesis H<sub>4</sub> is accepted partially (see table 5).

**Table 5: Path Decomposition Analysis**

Independent Variable	Effect	Dependent variable	
		Innovation	Firm performance
Knowledge Creation	Direct	.68**	.57**
	Indirect	—	.24**
	Total	.68**	.81**
Innovation	Direct		.35**
	Indirect		—
	Total		.35**

Note. \*\*t-value > |1.96|

## 6. Discussion

Using a sample of middle managers from Pakistan's telecommunication sector, this study integrated knowledge creation and innovation into a model for organizational performance. The study confirmed the direct association between both knowledge creation and firm performance, and innovation and firm performance. Furthermore, findings highlighted a potential mechanism for the impact of knowledge creation on firm performance: the mediating role of innovation.

The study found knowledge creation to be an influential factor for firm performance. Many scholars have also established this relationship in their respective studies. For instance, Liao and Wu (2010) noticed that effective knowledge creation facilitates the development of new organizational capabilities. Creation of new knowledge can help firms to develop new products more speedily and often at lower costs than their competitors. Yang (2010) were also of the opinion that knowledge creation process helps to extract and utilize the knowledge embedded in competitors, distributors, customers and suppliers, and thus, it provides firms with an opportunity to achieve profit, growth, efficiency, and sustainable competitive advantages.

In addition, knowledge creation is critical to innovation and the study noted a positive relation between the two. Scholars like Khedhaouria & Jamal (2015) found that the combination of existing and the newly created knowledge reduces the complexities in innovation process, and helps firms to rapidly develop innovative products and services. Pezzillo Iacono et al. (2012) also achieved similar results and advocated that quick and effective creation of new knowledge are the building blocks for innovation capacity of any organization. Thus, organizations wishing to sustain growth and succeed in the long run, need to continually produce innovative goods and services through continuous knowledge creation.

Innovation was found to share a significant direct relationship with firm performance, and this finding was in line with numerous prior studies. For example, Noruzy et al. (2013) concluded that innovations which are relatively hard to imitate, help firms to develop a long-lasting competitive edge over their counterparts and also substantially contribute to improvements in their performance. Similarly, Wang and Wang (2012) deduced that innovations develop new capacities for firms which enable them to swiftly and effectively respond to environmental changes, and augment their overall performance. The authors found that innovations improve organizational financial and market position by boosting sales, developing new markets, increasing customer retention and market share, and generating at least twice the income for the firm.

Most importantly, this study explored an integrated model whereby innovation was considered as a mediator in knowledge creation-firm performance relationship. As expected, innovation significantly, but partially mediated the effect of knowledge creation on firm performance. Various prior works have considered the direct relationship between knowledge creation and firm performance, and have also examined this relationship using mediating variables like dynamic capacity, new product development, knowledge intensity and managerial ties (Du Plessis, 2007; Esterhuizen et al., 2012; Shu et al., 2012). However, only a handful studies have incorporated innovation as a mediator in the relationship between knowledge creation and firm performance. Findings of this study indicate that firms with higher levels of knowledge creation have a greater capacity

to innovate, which consequently contributes to improvement in their financial and non-financial performance. This finding is somewhat in agreement with Sankowska's (2013) and Purcarea et al.'s (2013) study that achieved similar results for the mediating role of knowledge creation.

This study addressed the interrelationship between knowledge creation, innovation and firm performance in great detail

### *6.1 Implications*

This study provides certain important implications for practice. First, organizations should cultivate a culture conducive to learning as learning new skills, capacities and concepts is essential to create more knowledge and be innovative. Learning culture creates favorable conditions for employees to create, share and apply knowledge, and unlearn and relearn new sets of abilities. Learning culture supports providing both external and in-house training to employees. This develops new skills in employees, improves their competencies, and consequently broadens the knowledgebase and innovation capacity of organizations.

Second, organizational leaders should support knowledge creation and provide a vision for innovation. They should guide employees in determining the ways through which knowledge can be created, acquired, shared and applied. Through their actions and speech, leaders should urge employees to enthusiastically exert their time and efforts in creating knowledge. Leaders should wisely combine those tasks that allow and promote generation and growth of new knowledge, support its transference, and encourage its application within the organization. Additionally, to support innovation, leaders should nurture a climate of learning by doing. They should be tolerant towards mistakes and should consider them as learning opportunities.

Third, organizations should design or redesign their structure in a manner that it contributes to knowledge creation and innovation performance. An organization's structure should be such that it increases the frequency of interaction among employees; provides opportunities for knowledge acquisition, distribution and application; allows creative solutions to problems; accelerates adoption of innovation; and improves the effectiveness and efficiency of new idea implementation.

### *6.2 Conclusion*

To conclude, in response to previous research calls, this study worked on a sample of telecommunication companies' personnel and provided substantial empirical evidence regarding the role of knowledge creation and innovation in firms' performance. Findings from the SEM analysis show that knowledge creation considerably influences organizational capacity to innovate and perform exceptionally. Moreover, innovation has a partially significant mediating effect on the knowledge creation-firm performance relationship. Findings also support the second-order factor structure of the three variables. In general, this study provides support to the claim that creation of new knowledge is beneficial for firm's innovation capacity, and it may be the most critical strategy to effectively achieve performance-based outcomes. Findings not only present insights to address the question of what drives firm performance, but also contribute to integrate the literatures of knowledge management and innovation management. Besides, the study advises practitioners to focus on learning-conducive cultures, flexible structures

and learning-supportive leadership as strategies to effectively leverage organizational innovation and knowledge creation capacity.

### 6.3 Limitations and Future Research Avenues

Regardless of the encouraging results, this study has certain limitations. First, the sample was relatively homogenous as it consisted largely of men and only middle managers from the Pakistani telecommunication industry. Moreover, same sample provided the information regarding each variable, and that too, without any time lag. All this might have led to common-method variance and reduced generalizability of findings. In future, researchers should work on heterogeneous samples representing different industries so that diverse perceptions could be captured and findings could be more generalizable. Second, cultural background or heritage can influence knowledge creation processes and innovation, yet this study ignored this critical variable. Future research should investigate the moderating effect of national culture on this hypothesized model. Third, important micro variables, like organizational culture, structure, leadership and HR practices, have been found to significantly influence knowledge creation, innovation and firm performance, yet were not included in the present framework. Future studies should examine their effects to yield more diverse findings. Last, participants' perceptions regarding organizational innovation and performance were quantified to measure these two variables. Future research should measure them more objectively by using secondary data, like organizational or industrial publications.

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## Appendix

### List of Telecommunication Companies Surveyed in this Study

Company	Parent Company	CEO	Founded	Headquarters
Mobilink	Veon	Aamir Ibrahim	1994	Islamabad
Telenor	Telenor Group	Irfan Wahab Khan	2004	Islamabad
Ufone	Etisalat	Rainer Rathgeber	2001	Islamabad