



## Direct and Indirect effect of Knowledge Management Practices on Firm Innovation via Knowledge Application

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### ABSTRACT

This study examines the relationship between knowledge management practices and firm innovation with the mediating effect of knowledge application. For the said purposes, data were collected from 140 firms that belong to the services sector. 600 questionnaires were distributed in the services sector by using the drop-off and pick up technique. The number of returned questionnaires was 545, but 45 questionnaires were rejected because they did not contain the required information. A simple random sampling technique is used for the data collection. The sampling technique followed the steps recommended for studies utilizing structural equation modeling (SEM). The data was entered into SPSS and AMOS for structural equation modeling. The empirical analysis shows that knowledge generation and knowledge diffusion have a significant positive effect on firm innovation while knowledge storage does not affect firm innovation. Moreover, knowledge application mediates the relationship between knowledge generation, knowledge storage, and firm innovation. While knowledge application does not play the mediation role between knowledge diffusion and innovation performance. Also, this study furnishes several future directions for academic scholars and participation. The limitations have also been discussed.

**Keywords:** Knowledge Management Practices, Knowledge Generation, Knowledge Application, Knowledge Storage, Knowledge Diffusion, Innovation Performance

**JEL Classifications:** O31, O32

### 1. INTRODUCTION

The sustainable competitive advantage of the firm is based upon its unique resources which are possessed by the firm which helps the company performing outclass and excel in the market than other firms. The firms who have the ownership of distinctive resources differentiate the firm from other firms who don't have these distinct resources. The firm's resource-based view (RBV) makes a difference in the performance of the firm based on the resources possessed by the company (Alegre et al., 2013; García-Álvarez, 2015). Several earlier studies showed that the nation's and individual firm's economic development and sustainable competitive advantage are derived by the innovation which is a vigorous process in nature (Darroch and McNaughton, 2002). The increased rivalry of the firms which is the result of globalization and the development in the local, provincial and international

economies, for achieving competitive advantage firms needs to be innovative (Wu et al., 2018). Dickel and de Moura (2016) found that for achieving the firm's competitiveness, vigorousness, and progressiveness of company one of the crucial element is innovation. While a lot of importance has been given to innovation by the firms the researchers are trying to find out the means and ways through which the innovation of the firm can be developed and enhanced (Darroch and McNaughton, 2002; Donate and Guadamillas, 2011; Donate and de Pablo, 2015). In the modern era, with the increase in the trend of knowledge management the researcher is searching for the techniques that will help to understand the practices of knowledge management and how this is going to impact innovation (Johannessen, 2008; Lai and Lin, 2012; Lundvall and Nielsen, 2007). Few studies identified that the knowledge management vital antecedent of the innovation capacity of the firm. The results of some previous studies showed

that there is an interrelation between the managing knowledge of the firm and the innovation (Donate and de Pablo, 2015). Costa and Monteiro (2016) concluded that by applying knowledge in new goods and services and making improvement in the firm's products and services, improving the practices of the company, the procedures used for the production and manufacturing, strategies used for the promotion and advertisement of firm and innovation leads towards the sustainable competitive advantage of the organization. Despite the increased attention given to knowledge management and innovation, keeping in view the perspective of developing countries, it has been seen that very limited research has been conducted which can give the empirical evidence that shows the relationship between knowledge management practices and innovation at the firm level. It is found that very few studies have been conducted which examined the link between the variables of knowledge management and innovation. From some strategic, academic, and theoretical views and opinions, the connection between knowledge management and innovation is significant. While focusing on some academic and strategic reasons the linkage is essential. The top reason is that the value of the firm is improved by identifying, managing, and developing intangible properties and assets of the firm which is said to be the knowledge and capital that is intellectual. It also facilitates and enshrines the significance of the firm by using the firm's intellectual knowledge (Darroch, 2005).

Darroch and McNaughton (2002) revealed that some of the empirical research is providing direction for managing the intellectual capital and knowledge of the firm which is the intangible assets of the firm. Next, it has been seen that most of the past studies examined the relationship between knowledge management and innovation in developed countries. The studies have been conducted in settled countries (Alegre et al., 2013; Darroch and McNaughton, 2002; Dickel and de Moura, 2016; Donate and Guadamillas, 2011; Donate and de Pablo, 2015; García-Álvarez, 2015). There is a lack of study conducted in emerging and developing countries that examine the association between knowledge management and innovation. There is limited research in the context of emerging countries. Gaviria-Marin et al. (2019) in their recent research study used the bibliometric analysis which determined that very little researchers focused on issues that the developing countries are facing in knowledge management one of the countries which are especially not considering is Pakistan. Anning-Dorson (2018) showed the practices used by the firm specifically are limited to a context that cannot be generalized to the other contexts. So, for this reason, it is vital to examine the practices which can be used for other contexts only. The researcher needs to give attention to examine the practices which can be generalized to the different context and is not only specified to the firm only. There is a limited perspective covered by the research which studies the developed countries because it provides rare implications and few theoretical contributions to economic and geographical firms in the context. The research study of developed countries is restricted to a specific context only (Anning-Dorson, 2018). The results of this kind of research cannot be generalized other than some firms in the context.

There is a huge difference in developed and developing countries' markets and their structures. The focus of the researcher on the

developed countries has blurred the boundaries of emerging countries and their markets. This also decreased the importance of understanding the emerging markets and their needs. The replication of the findings to the other context and world without any proper contextual explanation may significantly diminish the contributions of developing markets to research. This article is going to test the association between different practices of knowledge management and innovation which is focusing on emerging market firms involved in providing services. The innovation process and procedures depend upon the knowledge so that's why it is important. This prevailing research is going to make three contributions to the literature. Firstly, the different practices of knowledge management are conceptualized in the paper which is specific in context and involves the functions of the organization that can be used for making improvements in innovation effectiveness are described in the article. Secondly, the paper is providing ways through which the different and various practices of knowledge management augments innovation effectiveness. Thirdly and lastly, the paper is demonstrating an investigation and analysis that how the practices of knowledge management are interacting with the innovation of the services sector firms of a developing country.

## 2. LITERATURE REVIEW

For exploring the relationship between different practices of knowledge management and innovation performance the perspective of this study has been drawn from knowledge-based review. The ways through which organizations can generate, attain, procure, secure, allocate, use, and consume knowledge comes under the umbrella of RBV. From RBV the Knowledge-Based View (KBV) is constructed, build, and extended (Grant, 1996; Nonaka and Toyama, 2015; Nonaka et al., 1994). According to the view of KBV, knowledge is perceived as a resource that holds the utmost strategic importance for the firm with regards to market value. Nonaka et al. (1994) indicted that creating and applying the knowledge is the essential objective of any company. The primary purpose of any firm is to generate knowledge and then use this knowledge. By developing and utilizing the assets related to knowledge a firm can gain a competitive advantage. KBV identifies that the firm can gain an advantage in the market by its assets of knowledge (Cabrera-Suárez et al, 2001). To achieve a competitive advantage in the market, knowledge is a unique core characteristic. Knowledge of any firm is providing the basis for gaining sustainable differentiation which is difficult for any organization to achieve in the market. Most of the resources related to knowledge are intangible and also dynamic (Curado and Bontis, 2006). The distinctive resources based on the knowledge of any firm is providing the organization a position which is making the company enjoy edge and benefit over the other firms in the market. However, it is complex, Martelo-Landroguez and Cegarra-Navarro (2014) found in their research that integrating and aligning innovation with intangible knowledge resources are crucial. The association of knowledge, as well as an arrangement of knowledge of the firm, are important with the innovation of any firm.

### 2.1. Knowledge Management Practices

From the perspective of the knowledge-based view (KBV) of the firm, the competitive advantage of any organization is

achieved from the knowledge of the firm. Knowledge is a core source for any organization in the attainment of competitive advantage. Knowledge management (KM) is becoming an interesting discipline. Because of its relevance with knowledge the academics, researchers, experts, consultants, and practitioners are giving importance for exploring the discipline of knowledge management (Alegre et al., 2013; Darroch, 2005; Gaviria-Marin et al., 2018; Swan et al., 1999). To improve the efficiency and production of the firm, gain and attaining sustainable competitive advantage, generation, and protection of the intangible assets of the firm knowledge are playing a central role (Alegre et al., 2013). Even though KM has been given very much importance, there is no clear definition of KM. This concept is still vague and not defined clearly and there is still no definition that is accepted universally of KM (Darroch and McNaughton, 2002). Nonaka et al. (1994) referred to the term of knowledge as “a multifaceted concept with multi-layered meanings”. Darroch (2005) described the concept of KM as the “management function that creates or locates knowledge, manages the flow of knowledge within organizations, and ensures that the knowledge is used effectively and efficiently for the long-term benefit of the organization”. Lai and Lin (2012) also defined KM “to describe how organizational members acquire and create knowledge from inside and outside the organization.” Knowledge management (KM) is described as the construct for acquiring, developing, creating, codifying, and using the knowledge within the firm (Shujahat et al., 2019). In the current paper, KM is used for describing the procedures and methods that will help in attaining, obtaining, and using the knowledge inside and outside of the firm which leads towards achieving the organizational goals and objectives.

KM denotes a whole process and practice which can vary from study to study (Findıklı et al., 2015). Alegre et al. (2013) showed the application and usage of the knowledge provide the foundation for the objectives of the company which is based on KM practices of the firm. While emphasizing the implicit and explicit knowledge some of the earlier conceptualizations on the practices of KM used to focus on the process of creating, generating, and transferring knowledge (Nonaka et al., 1994). By using the current concepts and constructs of KM is described in various techniques and ways. At the same time, few research identified KM practice as a core practice for disseminating and storing (Alegre et al., 2013), while on the other side some of the studies described KM practices as ample dimensions which cover acquiring, assimilating, transforming and exploiting (Xie et al., 2018).

According to the study of Lai and Lin (2012), there have been three processes showed that are capturing the practices of KM (a) generation, creation and acquisition of knowledge, (b) dissemination of knowledge, and its integration (c) storage of knowledge. Al-Emran, (2018) recognized that the key practice and process of KM is creating, transferring, and applying. Different researchers had given different views about the KM practices of the firm. In point of view of Costa and Monteiro (2016), the core process of KM is attaining, storing, codifying, sharing, applying, and creating knowledge. These practices can be exploitative or explorative from the perception of some of the earlier studies. The ways and tasks through which new knowledge is created and

generated are identified as activities of knowledge exploration. Through the exploration of knowledge new and fresh knowledge is attained. By using the research and development activities which are said to be R and D activities that are involved in creating and generating new knowledge are the initiatives which are initiated within the organization. Knowledge is created by the activities done inside the firm. The pool of implicit and explicit knowledge is added by the creation of fresh knowledge content or replaced by early content. The creation of knowledge either helps in generating new content or swapping the old one (Donate and de Pablo, 2015). Few researchers have concluded that the creation of knowledge is supposed to be a prerequisite and requirement for innovation (Costa and Monteiro, 2016).

On the other side while talking about knowledge exploitation it is demonstrated as the process that is used for transferring, application, and storing the existing pool knowledge and how the stock of knowledge is controlled by the firm (Donate and Guadamillas, 2011). The process of distributing knowledge from one place to another, one person to another person or one ownership to another is described as the transfer of knowledge (Hamdoun et al., 2018). This denotes how the experience of one unit influences the other unit within the firm. Alegre et al. (2013) indicated that to manage and store the knowledge of the firm, some techniques and systems are used which is identified as knowledge storage. The systems are IT-based which are supporting and enhancing the knowledge that is operational and used for storing and retrieving. The implied knowledge is acquired by people and networks of peoples that exist in the firm in numerous forms and methods which includes codifying the knowledge of human, expert’s techniques, documentation in written form, and the process and methods that are documented (Donate and de Pablo, 2015). In the study of Lai and Lin (2012) he concluded that innovation performance is influenced by knowledge storage.

Some earlier research proposed that developing the new product knowledge application is an ultimate accomplishment aspect and it is also the major characteristic of performance and innovation of the firm (Hamdoun et al., 2018). For achieving the organizational goals and purposes of the firm knowledge application is used for integrating knowledge that is gained from inside and outside sources (Shin et al., 2001). Boateng et al., (2015) indicated that for the generation of new knowledge, leveraging the knowledge and its operations for making improvements in the ways and enabling the organization uses the information within the firm knowledge application is providing the key process. Knowledge application is a means for improving the procedures that enable the firm to suitably using the knowledge. Solving the problems of the organization’s knowledge application in the firm provides the integration of knowledge which helps the organization in gaining competitive advantage (Shin et al., 2001). KM is trying to ensure that all the knowledge which is available in the organization is applied for achieving the organizational objectives because KM is the key and basic element of knowledge. Previous studies result highlighted that the efficiency of the firm is increased and the cost of a firm is reduced when the firm effectively applies knowledge (Allameh and Zare, 2011).

## 2.2. Innovation in Service Firms

As the economy is increasing to be more service-centered, it is being more important and significant for the services firms to make innovations in services that the firm is going to offer to the market and customers to achieve a competitive advantage in the market (Chen et al., 2016). Several past research showed a little innovation in the services with more focus on innovation which is technological. The researchers focused more on the innovation related to technology than innovation in services provided to the customer by the firm (Hertog, 2000). There has been seen bias in the direction of technological innovation which is providing an insufficient explanation for making innovation in the services firm. This bias prevailing because of the nature of services that are intangible and also the role the customer is playing while interacting. When there is a comparison made between the manufacturing and services sector, manufacturing of the products is more standardized than services which are not standardized as products. The services are supposed to be more circulated and dispersed as compared to the products. In manufacturing, the goods are centralized and more focused than services. In the services sector, the main focus is on offering services as compared to goods or products. Many earlier studies revealed that the change of the trend in the innovation in the services is also becoming significant (Cheng and Krumwiede, 2017). Hertog et al. (2000) described innovation in services “new service experience or service solution that consists of one or several of the following dimensions: new service concept, new customer interaction, new value system/business partners, new revenue model, new organizational or technological service delivery system.” For satisfying the needs and demands of the targeted, current, and potential customers, innovation in services is emerging and developing from the mixture of different services provided to consumers, the people, technology, process, and tactics (Chen et al., 2016).

Following the previous, the current study is defining innovation as “innovation in service as the process of developing something new or a combination of existing services in new ways that is beneficial to a target audience.” This describes that the customer is involved in producing the services. The procedure of producing services involves the consultation of consumers. The services are produced keeping in view the demands and needs of the potential consumer regarding the service which the firm is offering to them (Chen and Tsou, 2012). The innovation in services is applied to multiple and different stages and also to a variety of areas of instructiveness having different applications, values, implications, and meanings of the definition. Therefore, a little change, improvement, or alternation in service that can be incremental can make the service innovation that ranges from a whole new kind of innovation or innovation which can be discontinuous (Cheng and Krumwiede, 2012).

Bettencourt et al. (2013) disclosed that innovation needs to be in a way that enables the service firm to look through the opportunities and chances for breakthrough service offerings which are not restricted by the services the firm is providing at the current time or trying to offer in near future to the customers. This exhibited that supporting a firm to have the capacity of competing in the market by strengthening its services and

making improvements and developments in performance is a core feature of service innovation (Chen et al., 2015). Chen et al. (2016) argued that the performance of the firm can be enhanced from gaining access to the trends of the market and improving the firm’s learning capabilities that are supported and enabled by the service innovation of the firm. Past research concluded that there is an intimidating relationship between service innovation and the performance of new service (Cheng and Krumwiede, 2012).

## 2.3. Research Hypotheses

### 2.3.1. *KM practices and innovation*

From the viewpoint of developing countries, there has been seen a dearth of study which is associating KM practices and innovation. There is a lack of research from emerging countries on the link between these two variables. Darroch and McNaughton (2002) discussed that in some studies when the interrelation between these variables has been examined it showed no link which is because of the difference in the type of industry that can be manufacturing and service industry. It has also failed to show any link because there is a different kind of innovation which is radical and incremental. So that’s why it is not clarified how there can be any connection between KM practices and innovation. Donate and de Pablo defined KM as “KM practices is a set of strategies, initiatives, and activities that firms use to generate, transfer, apply and store knowledge” (Donate and de Pablo, 2015). According to Du Plessis (2007) innovation is playing its role in the organization for distribution and sharing of implied knowledge and facilitating the systematization which is related to KM practices and knowledge.

The results of the past studies showed that the innovation capacity of any firm is boosted up by the efficacious management of knowledge (Donate and Guadamillas, 2011; Donate and de Pablo, 2015). These findings are consistent with the results of Darroch and McNaughton (2002) research which highlighted that innovation performance is effected by KM practices. The research findings of Donate and de Pablo (2015) also revealed that the performance of the firm in making the product innovative is enriched and enhanced by KM practices (exploration and exploitation). KM practices also play a mediating role between innovation and other variables and besides it also has a direct link with innovation (Costa and Monteiro, 2016). From the perspective of Abou-Zeid and Cheng (2004), while identifying the significance of KM to innovation, they observed that the success of the procedure of innovation is affected by the affinity between the nature of knowledge which is linked with innovation and activities that is used for manipulating the knowledge.

Earlier to this some of the study’s results also indicated that there is an effective association between KM and innovation. Inkinen et al., (2015) examined that although KM has been seen supported to innovation performance, not all the KM practices need to have direct linkage with innovation performance. At the same time some of the results highlighted that innovation is not impacted by the practices of knowledge protection (Inkinen et al., 2015), some more findings showed that innovation

performance of the firms is enhanced by every different construct of knowledge (Wang et al. 2018). Wang et al (2018) argued that knowledge significantly predicts acquisition radical innovation of the company, nonetheless, Darroch and McNaughton (2002) studied that there is a significant association between KM practice (acquisition, distribution, and approachability to knowledge) and incremental innovation.

On the other hand, Shujahat et al. (2019) discovered that there is an indirect connection between knowledge creation and innovation. The creation of knowledge inversely facilitates innovation. Zhang et al. (2012) examined that explicit and implicit practices of sharing knowledge influences performance and innovation. The outcomes of Zhang et al. (2012) research further determines that explicit knowledge sharing more significantly predicts financial performance and innovation speed, whereas tacit sharing of knowledge significantly influence on operational performance and innovation quality. Ritala et al. (2015) found that knowledge sharing impacts positively on innovation performance. Even though the outcomes proposed that innovation performance is influenced by KM practices in many different ways. Du Plessis (2007) determined that innovation enormously is dependable on knowledge because of intricacy in innovation upsurges with the advancement in the knowledge which is accessible to the firm. Mardani et al. (2018) concluded that KM activities have a direct effect on the performance of firm and innovation, and it has an inverse impact by increasing the capability of innovation. On the whole, the results disclosed that the creation of knowledge, integration, and usage of knowledge assist the performance and innovation (Mardani et al., 2018). As the results revealed that there are mixed findings on the association of KM practices and innovation, it doesn't highlight that in which way the practices of knowledge management influence and facilitate innovation.

The current research studies various KM practices and the ways through which the firm's innovation capability can be enriched by the integration of the different KM practices. According to the study of Darroch (2005), it is indicated that the innovation of the firm will increase with the better capacity of managing the knowledge of the firm and efficiently utilizing the resources of an organization. This will also encourage the company to perform better and achieving its objectives. The predominant research is going to identify the dispersion of knowledge, its creation, storage of knowledge, and the knowledge application as the basic KM practices that will not only influence the innovation of the firm but also enhances it. As a result, this research hypothesizes that KM practices have a direct impact on innovation of service firms.

H1: Knowledge management practices has a positive influence on firm innovation

H1a: Knowledge generation has a positive influence on firm innovation

H1b: Knowledge Storage has a positive influence on firm innovation

H1c: Knowledge diffusion has a positive influence on firm innovation

### 2.3.2. *The mediating role of knowledge application*

Creating value of the firm knowledge application (KA) is an important point that is more dynamic and significant that is a pivotal element of knowledge management. It is providing more active knowledge which is helping in creating the value of the firm (Choi et al., 2010). In the view of KBV, knowledge application is the mean by which the value of knowledge is originated due to its cohesive and implicit nature (Jugend et al., 2017). The increase in efficiency of the firm, reduction in laying-off of employees, fewer chances of errors and gaffes and constantly using the expertise of the firm for creation of the products or services which is offered by the firm is the result of the proper and accurate knowledge that will be helpful for the success of the organization (Chen and Huang, 2009).

The technology system of any organization and its managerial and executive development can be improved rapidly by using the knowledge application. The firm can also increase the expansion of the new product which is launched by them and also the procedure of product improvement can be enhanced through the use of knowledge application. There is various kind of knowledge that is disseminated and accessible within the firm which is related to KA. The knowledge that is generated, communal, and collective is also interrelated with KA (Chen and Huang, 2009; Shujahat et al., 2019).

According to Shujahat et al. (2019), knowledge is important when it is in practical form, realistic, and applied. It has no importance until it is not functioned so KA holds more significance while making its comparison with other practices which is knowledge creation and sharing of knowledge. In point of view of Sarin and McDermott (2003), the members of any firm or company will generate more results and make the preferred and anticipated outcomes. At the same time in various past studies, KA has been either taken up or not considered as a variable that can have a relationship with innovation performance (Choi et al., 2010). The prevailing research is going to examine the mediating role of KA which will influence the association between KM practices (creation, dispersion, and storage) and firm innovation. The purpose of the research is to identify that if knowledge is applied and used for delivering goods and providing services and solving the problems faced in doing so, it is going to be more efficient and effective for the creation and dispersion of knowledge (Jugend et al., 2017). Consequently, the current study postulates that:

H2: Knowledge application mediate the relationship between knowledge generation. Knowledge storage, knowledge diffusion, and firm innovation.

## 3. METHODOLOGY

This research employs a survey methodology to collect primary data for empirical analysis. The sample is made up of a selection of services firms. The services sector is suitable for this study because the services sector contributes more than 50% of GDP in the growth of Pakistan. The services sector is very innovative and knowledge-intensive to examine the impact of knowledge management practices and innovation. This study is cross-

sectional which means that the data has been collected at one point in time. This design is considered good because it measures the respondent's attitude at the same time (Curado and Bontis, 2008). A simple random sampling technique is used for the data collection. Data were collected from 140 firms that belong to the services sector. 600 questionnaires were distributed in the services sector by using the drop-off and pick up technique. The number of returned questionnaires was 545, but 45 questionnaires were rejected because they did not contain the required information. The sampling technique followed the steps recommended for studies utilizing structural equational modeling (SEM). According to Anderson and Garbing (1998), 200 sample size is sufficient for structural equational modeling, but in the case of more than 200 is considered good. The software used for empirical analysis by SPSS and AMOS.

### 3.1. Measures

All items were measured by using a 5 point Likert scale. In this study, knowledge management practices were measured with 4 sub-dimensions named knowledge diffusion, generation, storage, and application. The total number of knowledge management items were 40. Knowledge generation and knowledge application were measured with 12 items, the scale developed by. Knowledge diffusion was measured with 6 items, scale developed by (Darroch, 2005; Villar et al., 2014). To measure knowledge storage, this research used 10 items, scale developed by (Alegre et al., 2013). Innovation performance was measured with 10 items, scale developed by (Ngo and O' Cass, 2009).

## 4. RESULTS

### 4.1. Reliability Analysis

Cronbach alpha is used to measure the internal consistency between the variables. As can be seen in Table 1 all variables except one variable have reliability more than 0.70 as suggested by (Nunnally and Bernstein, 1978). Cronbach alpha is also acceptable if the value lies in the range of 0.60-0.70 as knowledge diffusion can be seen who have Cronbach alpha 0.68.

### 4.2. Correlation Matrix

Correlation analysis performed to check the association between the variables (knowledge generation, knowledge application, knowledge diffusion, knowledge storage, and innovation). If the value of correlation lies between  $r = 0.5$  to  $r = 1.0$  or  $r - 0.5$  to  $-1$  is considered good and indicates that two variables are strongly correlated. Knowledge generation has a positive strong relationship with knowledge application, knowledge diffusion, knowledge storage except for innovation performance. Knowledge application has a strong relationship with knowledge diffusion,

**Table 1: Reliability analysis**

Variable	No of items	Cronbach alpha
Knowledge generation(KG)	12	0.766
Knowledge application ( KA)	12	0.790
Knowledge diffusion ( KD)	6	0.685
Knowledge storage (KS)	10	0.749
Innovation (INN)	10	0.794
Overall reliability	50	0.879

knowledge storage, and innovation performance. Knowledge diffusion has a positive relationship with knowledge sharing except for innovation performance (Table 2).

### 4.3. Confirmatory Factor Analysis (CFA)

Confirmatory factor analysis is used to measure the validity of the variables. It tells about the discriminant validity which is meant by that two variables are unrelated. All values are according to recommended values which can be seen in Table 3. Hu and Bentler (1999) described that CFI and RMSEA are important for model fitness.

### 4.4. Structural Equational Modeling (SEM)

The SEM model was employed to examine the relationship between independent variables and the dependent variable. SEM analysis was performed by AMOS 21 version. According to the study, we hypothesized 2 paths including 6 sub hypotheses. According to results, the first hypothesis who has 3 sub hypothesis are accepted except second sub hypothesis (KNS INN). The first sub hypothesis is to examine the effect of knowledge generation on innovation performance. Results depict that knowledge generation has a strong effect on innovation performance ( $P < 0.05$ ). The second sub hypothesis is related to check the effect of knowledge storage on innovation performance which is insignificant ( $P > 0.05$ ). The third sub hypothesis is to check the effect of knowledge diffusion on innovation performance which is supported ( $P < 0.05$ ) (Table 4).

### 4.5. Bootstrapping

Bootstrapping is a resampling technique where the original sample size maybe converts into a sub-sample size. For the empirical analysis, it is appropriate to resample the original sample size.

**Table 2: Correlation matrix**

	1	2	3	4	5
Knowledge generation (KG)	1				
Knowledge application (KA)	0.451**	1			
Knowledge diffusion (KD)	0.517**	0.439**	1		
Knowledge storage (KS)	0.495**	0.355**	0.518**	1	
Innovation ( INN)	0.010	0.134**	0.086	0.062	1

**Table 3: Confirmatory factor analysis (CFA)**

Measures	Scores	Recommended values
Chi- square/df (CMIN/DF)	1.560	<3.0 <sup>a</sup>
Comparative fit index (CFI)	0.907	>0.90 <sup>a</sup>
Goodness of fit index ( GFI)	0.902	>0.90 <sup>a</sup> < 0.80 <sup>b</sup>
Root mean square residual (RMSEA)	0.034	<0.08 <sup>a</sup>

<sup>a</sup>acceptable, <sup>b</sup>marginal

**Table 4: Structural equational modeling (SEM)**

Hypothesis	Estimates	P-value	Results
KNG→INN	0.384	***	Supported
KNS→INN	-0.094	0.154	Not supported
KND→INN	0.505	***	Supported

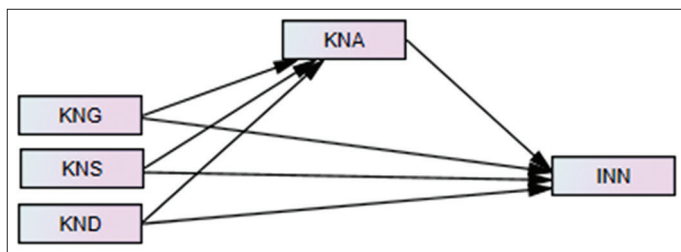
When regression analysis performed, regression considered a large sample size, which the researcher mentioned in several bootstrap samples. In this model, it can be said that the effect of knowledge generation on innovation performance changed when knowledge application introduces as a mediator. The second hypothesis is to check the effect of knowledge generation on innovation performance when it is intervened by knowledge application. The results indicate that direct effect without mediation is 0.392\*\*\*, direct effect with mediation is insignificant with beta value 0.042 which can be seen in Table 5, while the indirect effect is also insignificant with the beta value 0.010. So, it is a type of full mediation. The second hypothesis is relating to knowledge storage, knowledge application, and firm performance. The results indicate that direct effect without mediation is -0.165\*\*\*, direct effect with mediation is also significant with beta value 0.361\*\*\* which can be seen in Table 5, while indirect effect also insignificant with the beta value 0.090\*\*. So, it is a type of partial mediation. The third hypothesis is to check the mediating effect of knowledge application between knowledge diffusion and firm innovation. The results indicate that direct effect without mediation is 0.475\*\*\*, direct effect with mediation is insignificant with beta value 0.163 which can be seen in Table 5 and Figure 1, while the indirect effect is also insignificant with the beta value 0.041. So, it is no mediation.

## 5. DISCUSSION, IMPLICATIONS AND CONCLUDING REMARKS

### 5.1. Theoretical Contributions

The study is making some theoretical contributions to the existing literature. According to the perspective of several researcher's knowledge management is a core antecedent of the innovation capacity of the firm. There is a strong relationship found by many authors in the management of knowledge and a firm's capacity for making innovation. There has been seen an increase in the trend of exploring the effect of the practices of knowledge management on different outcomes of the firm. Many researchers concluded that organizational outcome is influenced by various practices of knowledge management. Even though there has been seen an

**Figure 1:** Research model in the context of Pakistan and hypothesis testing



**Table 5: Mediation analysis**

Hypothesis	Standardized total effect	Standardized direct effect	Standardized indirect effect	Results
KNG-KNA-INN	0.392***	0.042 (NS)	0.010 (NS)	Full mediation
KNS-KNA-INN	-0.165 (0.012)	0.361***	0.090***	Partial mediation
KND-KNA-INN	0.475***	0.163 (NS)	0.041 (083)	No mediation

increasing interest of researchers on exploring the association between knowledge management and innovation, it is hard to found any empirical evidence which studied the link between the practices of knowledge management and the effectiveness of innovation from the perspective of developing countries.

The prevailing study is going to fill the gap in the existing world of knowledge by proposing a model which is exploring that how the generation of knowledge, storage of knowledge, and diffusion of knowledge influencing the innovation of the firm with the mediating role of application of knowledge. The postulated hypothesis of the study is confirming three hypotheses out of four which is providing empirical evidence. The mediating role of the mediator of study which is the application of knowledge in the firms providing services is also supported. The existing study is also exploring that how the application of knowledge is helping the different practices knowledge management for enhancing the innovation of the firm but it is not justifying the influence of these practices of knowledge management that is a generation, storage, and diffusion.

### 5.2. Practical Implications

The present study is also going to derive some practical implications. The study is guiding the developing countries' services firms for enhancing the innovation of the firm by using different practices of knowledge management. The various practices of knowledge management are suggesting some specific processes and procedures to the services firms for focusing on the innovation of the firm. The service firms is reflecting and using the different roles of the various practices of management of knowledge and how these practices are interacting in different kind of ways to affect the innovation of the firm. The research is also showing that by applying implicit and explicit knowledge any service firm can enhance and enrich the effectiveness of innovation. The study suggested that innovation in any organization can be facilitated by different practices of management of knowledge when it is leveraged by the application of knowledge.

### 5.3. Limitations

There are some limitations to the prevailing study. The findings of the research revealed from the self-reported data so this is leading to the potential and possible common method variance. The research is conducted using the approach which is cross-sectional and it is not reflecting that how the mechanism can be explored and investigated when the research is performed in the long-term. The variable which is practices of management of knowledge is multidimensional. The present study only focuses on the four dimensions that are the generation of knowledge, storage of knowledge, diffusion of knowledge, and application of knowledge. The other dimensions of knowledge management that are not touched in the study that are important in the same

way can also be examined and investigated for the innovation of the services firms.

#### 5.4. Opportunities

There are some following opportunities and suggestions that are indicated for the future researcher. The future researcher can research the different industries for examining the relationship of practices of management of knowledge and innovation of the firm. A longitudinal approach can be used to examine the long-term influence of the practices of the management of knowledge. The focus of future research can be on the specific practices of knowledge management and exploring the influence of these specific practices on the innovation of the firm. They can explore how this mechanism is working in practice.

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