How do knowledge-intensive business services improve innovation? A resource-based model for antecedents of innovation in a developing country

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Abstract

Purpose – Firms strive to find new ways of boosting value creation through integrating knowledge for innovation. Open innovation has altered this quest for excellence and accordingly, this research aims to investigate the antecedents and enablers of innovation performance in firms belonging to a knowledge-intensive service sector of a developing country.

Design/methodology/approach – As such, data were gathered through a survey approach, targeting telecom service firms in Pakistan. Hypotheses were tested using the Partial Least Squares (PLS) technique. Measurement and structural models were assessed following the recommended two-stage procedure.

Findings – Results showed that knowledge sourcing and customer engagement impact the innovation performance of firms, while transformational leadership, knowledge sourcing and customer engagement are linked to innovation with the mediating effect of absorptive capacity.

Practical Implications - This research helps to improve the innovation management practices of the firms belonging to this important sector and thus enables them to achieve sustainable competitive advantage through building their absorptive capabilities.

Originality/value –Knowledge-intensive business services are largely excluded from the great debate on open innovation so far, with a few exceptions. Our research proposes and tests a model of enablers of open innovation that contributes towards improving the innovation performance of telecom firms in a developing country.

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Introduction

How firms should leverage knowledge management capabilities for value creation while engaging with all relevant stakeholders has been an area of interest for researchers for some time (Tantalo & Priem, 2016). Open innovation is a paradigm according to which firms can and should search for information and knowledge from outside the firm boundaries to accelerate innovation processes (Dahlander & Gann, 2010). Since the seminal study by Chesbrough (Chesbrough, 2003), researchers have explored various factors influencing a firm's capability to use these internal and external sources of knowledge to enhance innovation performance, in different contexts, such as larger firms (Chesbrough & Brunswicker, 2014; Mortara & Minshall, 2011;) and small and medium organizations (van de Vrande et al., 2009), low tech firms (Laursen & Salter, 2003) and high-tech (Tzokas et al., 2015).

Most of these studies, however, were conducted in the context of developed economies and recently the attention has been shifted to less developed countries. Firm-level open innovation models are instrumental in the management of innovation and help in decision-making processes in developed economies but the relevance of such innovation models in less developed countries is still not fully understood (Pérez et al., 2019). This issue is critical since developing economies are usually characterized by economic and market constraints, have weaker institutional frameworks, and are limited by average or low innovation performance (de-Oliveira & Rodil-Marzábal, 2019). Yet, they are still excluded from the great debate on open innovation so far, with a few exceptions (Wadho & Chaudhry, 2018; Bhatti et al., 2021).

Disaggregated studies on innovation in developing countries context hint at some of the factors necessary for value creation through innovation but lack a holistic model. In their study of employees belonging to different sectors of Pakistan, Tipu et al. (2012) discovered that

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transformational leadership was significantly related to innovation propensity with the mediating role of organizational culture. Similarly, Perez et al. (2019) developed a framework to analyze the critical factors influencing the types of innovation and did a comparative analysis of organizational performance in the manufacturing sectors of Peru and Chile. Furthermore, their results suggested that knowledge sourcing from foreign customers and suppliers is significantly related to a firm's decision to innovate.

Context shapes the innovative patterns we observe in firm level data in developing countries, which is unique as compared to prior research conducted in developed countries. According to Nelson and Winter (1982), knowledge in organizations is highly contextualized and mutually dependent on the firm environment. Firstly, Pietrobelli and Rabellotti (2011) maintained in their study that there are several ways the innovation process differs in different contexts. In less developed countries, innovation is dependent upon non-R&D activities which may include operationalizing technology that is new to the situation of application (Bell, 2007). Secondly, the source of innovation in such contexts, e.g., universities, research, and development (R&D) labs, and public and private research institutes, may either not exist or have inadequate resources. Furthermore, weak or no linkages exist among them resulting in a lack of ideas for the generation of innovation. Thirdly, inflows of knowledge and technology from external sources are essential but missing components of the innovation and learning processes in less developed economies. Due to weaker infrastructure and low support, innovation management is a complex task for firms belonging to developing economies and thus more research is required for such firms to fully explore and exploit knowledge and resources to improve their performance.

Traditionally, innovation has been associated with technological advancements only, but within an open innovation paradigm, it involves a set of complex interconnected processes and

hugely depends on resource sharing through inside and outside knowledge channels (Chesbrough & Crowther, 2006). These resources can be utilized to explore, convert, and utilize external and internal knowledge to enhance the innovativeness of the firms (Naqshbandi & Nasimuddin, 2022; Papa et al., 2020; Santoro et al., 2020).

The stakeholder theory stresses the need to involve different types of stakeholders in value creation (Tantalo & Priem, 2016). Internal stakeholders, especially leaders, are responsible for developing and executing strategies to continuously improve the efficiency of internal and external processes of the firms. From the leadership behaviour perspective, if the leadership provides consistent support for innovation and creativity, their subordinates follow (Singh, 2008). However, the role of transformational leaders in managing knowledge is lacking in developing countries' service companies (Lakshman, 2007; Ting et al., 2021). Similarly engaging internal and external customers has proved to be crucial in the process of open innovation where customers can play an integral role in idea generation (Xie et al., 2021). Thus, we maintain that customer engagement is a primary antecedent of the innovation outcome process in KIBS.

Over the last few years, researchers have shown considerable attention to absorptive capacity in relation to innovation, e.g., testing the mediating role of knowledge sourcing and innovative performance (Ferreras-Méndez et al., 2015; Hussain et al., 2022; Kapoor & Aggarwal, 2021). Therefore, to understand how transformational leadership, knowledge sourcing and customer engagement influence innovation, we assess the mediating role of absorptive capacity. In this way, we aim to integrate stakeholder theory with RBV to propose and test a comprehensive framework to fully explain innovation management in knowledge-based services in a developing country context. We believe that our research will be beneficial to the current debate on knowledge management in the open innovation paradigm in the following ways.

First, the role of internal stakeholders including top management in introducing and assisting innovation has been emphasized by previous researchers (Montes et al., 2005; Singh et al., 2019). Recent work has begun to gather scholarly attention towards the projected effect of transformational leadership on innovation at the organizational level (see e.g., AlNuaimi et al., 2021). However, mostly innovation proxies were used to measure innovation outcomes or else only one type of innovation was considered that lacked an all-inclusive view of innovation performance. For example, Jung et al. (2003) consider the number of patents and R&D spending as a proxy, whereas Vaccaro et al. (2012) explored the relationship between transformational leadership and management innovation. Our research tries to enrich the analysis by employing a comprehensive measure of innovation performance, referring to product/service, process, management, and marketing innovation types.

Second, as per the knowledge-based view of the firm, the application of knowledge and information in the modern days necessitates that organizations can convert it into innovative products and services (Escribano et al., 2009). Most researchers agree that new product development (NPD) is dependent on the exploration and search of new knowledge and information from external sources (Katila & Ahuja, 2002). Hence, it is critical to understand the impact of knowledge sources and explore their role in innovation outcomes of the knowledge intensive business services (KIBS).

Theoretical Framework and Hypotheses Development

We have based our integrated research framework on the tenets of dynamic capabilities (DC), knowledge-based view (KBV) and stakeholder theory (ST) of the organization. DC underlines the importance of developing certain capabilities which are necessary to gain a competitive advantage (Bargoni et al., 2023; Caputo et al., 2021; Easterby-Smith & Prieto, 2008).

Similarly, the knowledge-based view maintains that as a strategic asset in the organization (Bhatti et al., 2023), knowledge acquisition and transformation are key for innovation processes and value creation (Xiao & Yuting, 2022) Finally, stakeholder theory stresses the importance of incorporating stakeholders (both internal and external) in the innovation process, especially in the services sector. Thus, we also maintain that KIBS can utilize the knowledge sourced and acquired through a variety of sources (both internal and external) can help build dynamic capabilities of the firms that will improve their innovation performance.

Transformational Leadership and Innovation Performance

Leadership is central to the management of organizations and essential for decision making processes. Robust leadership also strongly influences the innovation performance of the firms (Gumusluoglu & Ilsev, 2009). Transformational leadership has been indicated as a critical factor in influencing follower behavior (Gong et al., 2009) and has been defined as "broadening and elevating followers' goals and providing them with confidence to perform beyond the expectations specified in the implicit or explicit exchange agreement" (Dvir et al., 2002). In his seminal book titled "Leadership and Performance Beyond Expectations", Bass (1985) argued that transformational leadership leads to improvement in performance beyond expectations.

Previous literature has shown that transformational leadership has a significant impact on performance at individual, team, and firm levels (Judge & Piccolo, 2004). Positive leadership traits such as transformational leadership play a crucial role in creating conditions favorable for innovation management by creating trust among employees (Podsakoff et al., 1996), and improving communication among team members (Bhatti et al., 2020). Transformational leadership is characterized by using key behaviors/ practices such as inspirational motivation and intellectual

stimulation – factors critical for improving organizational innovation (Elkins & Keller, 2003). Extant literature shows that leaders who truly reflect "the championing role" of transformational leadership promote creativity and innovation within their organizations (Howell & Higgins, 1990). Transformational leaders improve the creativity of their followers through the effective engagement of employees in intellectual stimulation and consequently inspire them to be innovative (Gong et al., 2009).

In addition to studying the impact of leadership at the individual level, more recently, researchers have looked at the impact of leadership at the firm level. In a study of R&D personnel and managers in software development companies, Gumusluoglu and Ilsev (2009) showed that transformational leadership has a significant impact on individual creativity and firm innovation. Similarly, Garcia et al. (2008) also showed that to compete in intellectual-capital-based emerging markets transformational leadership plays a critical role in encouraging firm innovation. We believe that transformational leadership supports the creation of capabilities that help KIBS improve their innovation performance. Thus, using the lens of Dynamic Capabilities, we hypothesize:

Hypothesis 1. Transformational leadership has a positive impact on innovation performance of KIBS in a developing country.

Knowledge Sourcing and Innovation Performance

Many researchers have highlighted the significance of the knowledge-based view of the firm that enables knowledge exchanges amongst several actors in different firms including the services sector (Mina et al., 2014; Santoro et al., 2018). In an empirical study encompassing a variety of sectors, the researchers found that knowledge management and open innovation

consisting of both internal and external sources of knowledge are critical sources of competitive advantage for firms (Santoro et al., 2018; Jabeen et al., 2023).

The paradigm of open innovation also signifies the effective utilization of knowledge sources for improving innovation performance (Vrontis et al., 2023). Both formal organizational networks and informal interpersonal networks help organizations improve their innovation performance with the help of external sources of information (Caputo et al., 2021; Hansen, 2002). External stakeholders involved in information and knowledge sourcing include lead users (von Hippel, 2001), suppliers (Wagner, 2009), and universities (Minshall et al., 2007). Past research indicates that through sourcing knowledge from external stakeholders, firms can develop and maintain meaningful relations (Parida et al., 2012).

Building collaborative relations is one of the most important strategies for fostering firms' innovation in transition economies (Xie et al., 2009). Researchers also studied the impact of environmental factors on innovation and found that market sources are also a significant source of information for firms involved in innovation (Lin & Lin, 2010). Similarly, outcomes of failed projects or processes can serve as a source of innovation by providing an understanding of issues that resulted in their failure (Townsend, 2010).

Extant studies on the knowledge-based view provide empirical evidence that information sourcing practices of firms, aligned with their technological strategies, can substantially influence the innovation outcome (Katila, 2002; Bhatti et al., 2021; Hussain et al., 2022). Vega-Jurado et al. (2009) explored the impact of industrial and scientific sources of innovation on product and process innovation and found a significant relationship. The search for knowledge that guides organizations toward novel ideas for innovation or assists in the realization of new means to

explore knowledge sources leads the managers towards new strategies and critical ideas for NPD (Li et al., 2013). Similarly, variety in knowledge sourcing positively affects innovation performance in knowledge intensive services (Rodriguez et al., 2017). Therefore, utilizing a knowledge-based view of the firm, we propose that several knowledge sources will significantly impact the innovation performance of KIBS in a developing country:

Hypothesis 2. Knowledge sourcing has a positive impact on the innovation performance of KIBS in a developing country.

Customer Engagement and Innovation Performance

Being an integral part of stakeholders, a lot of attention has been given to customers and users and their role in innovation in the context of innovation in services (Mina et al., 2014). In the knowledge economy, telecom and IT services are continuously in a phase of rapid service development, and the motivating factor behind it is the demand from the market (Saldahna et al., 2017). A significant process in the new service development (NSD) is the ability to develop and integrate market and customer information in the products and services (Mina et al., 2014). According to Agarwal and Selen (2009) when employees are empowered to grasp customer beliefs, they end up providing customized innovative products and services. Users have been identified as a valuable source of knowledge and innovation for a variety of sectors. Furthermore, engaged customers enable businesses to understand the needs and demands of the market and thus improve the flexibility and adaptability of the processes for coming up with new and innovative ideas (Johansson et al., 2019). Thus researchers have also stressed the importance of customer engagement in service innovation for better value creation (Mina et al., 2014). Thus based on the stakeholder theory, we propose our next hypothesis:

Hypothesis 3. Customer engagement has a positive impact on the innovation performance of KIBS in a developing country.

Mediating Role of Absorptive Capacity

With roots in the philosophy of dynamic capabilities view of the firm, absorptive capacity encapsulates the firm's capability to secure, store and then employ knowledge to successfully run innovation projects. The term was first coined by Cohen and Levinthal (1990), who described it as "*the firm's ability to identify, assimilate, and exploit knowledge gained from external sources*". Thus, firms need it to fully capture and utilize the information and knowledge gained from external sources (Fabrizio, 2009). It is one of the key predictors of innovation performance (Bresciani et al., 2023). In this sense, the path from the searching and sourcing of knowledge to its application entails the analysis, understanding and retention of knowledge (Argote et al., 2003; Papa et al., 2020). Past research has proved that firms' absorptive capacity has a strong influence on innovation as it is determined by the extent to which they can utilize external knowledge sources (Saemundsson & Candi, 2017). Thus, to successfully exploit external and internal sources of knowledge, firms need to have certain internal capabilities.

Absorptive capacity has been shown to mediate the relationship between knowledge sourcing and innovative performance (Dezi et al., 2018). For example, Costa and Monteiro (2016) explored the role of absorptive capacity as a mediator between knowledge acquisition, knowledge sharing, and companies' organizational innovation and found knowledge acquisition from external partners significantly reinforces absorptive capacity. Firms in developing economies have much to gain from both knowledge sourcing and absorptive capabilities due to resource scarcity and lack of basic infrastructure. Absorptive capacity is strongly associated with innovation management and

performance in a variety of sectors and at regional level innovation (Grimpe & Sofka, 2009). Thus, we hypothesize that as per the tenets of DC theory, this relationship holds for KIBS belonging to developing countries as well:

Hypothesis 4. Absorptive capacity mediates the relationship between knowledge sourcing and innovation performance of KIBS in a developing country.

Leaders play a critical role in the development of a conducive culture and organizational structures and engagements to enhance the absorption, assimilation and application capabilities of the employees working in the organization (Naqshbandi & Tabche, 2018). Since human resources are one of the most important assets of the organization for innovation (Bhatti et al., 2020; Papa et al., 2020), transformational management is assumed to be a critical characteristic of leaders of all levels since it directly impacts individual level performance (Singh et al., 2019). Furthermore, transformational leadership can improve firm performance by stimulating the absorptive capabilities of the employees (Bass, 1999).

One of the ways through which transformational leadership enhances absorptive capacity is by boosting employee morale through psychological empowerment and autonomy (García-Morales et al., 2008). Leaders instill in their followers a sense of pride by providing them means of gaining information, giving them responsibilities, and training them to acquire skills and competencies which will then be used by them to acquire, assimilate, and transform knowledge, thus accumulating higher levels of the absorption process. They clarify the job responsibilities and introduce perks and incentives to inspire the employees to attain, absorb and share information and knowledge with other employees to enhance creativity and innovation. Therefore, it is reasonable to infer that there is a complementary effect between transformational leadership and absorptive

capacity in enhancing innovation performance for KIBS in developing economies. Thus, combining the tenets of stakeholder theory and the dynamic capabilities view, we propose:

Hypothesis 5. Absorptive capacity mediates the relationship between transformational leadership and the innovation performance of KIBS in a developing country.

According to the service-dominant logic, an integral part of the dynamic resources of the firm originates from the knowledge obtained from different stakeholders especially the users of that service (Vargo & Lusch, 2008). Customer engagement thus initiates the dynamic capabilities of the firm to encourage customers to participate and engage during the service provisioning and through this engagement and capacity building processes, firms can meet the demands and expectations of the users with new and innovative solutions (Xie et al., 2021). In this way, customer engagement allows firms to utilize knowledge to build an important resource for service and product innovation (Heirati & Siahtiri, 2019). According to researchers, innovation performance is strongly related to absorptive capacity, technology capability and customer relationship management (Tzokas et al., 2015). In other words, the firm needs to build absorptive capacity to be able to capitalize on the insights and knowledge coming from stakeholders including customers. Considering the above argumentations, we propose our next hypothesis as:

Hypothesis 6. Absorptive capacity mediates the relationship between customer engagement and the innovation performance of KIBS in a developing country.

The proposed model of the research is shown in Fig. 1.

Insert Figure 1 about here

Methodology

Data Collection

This research is based on a quantitative methodology and data were collected using purposive and snowball sampling techniques. The purposive sampling technique has been used in research that involves selecting certain cases based on a specific purpose (Teddlie & Tashakkori, 2003). According to Heckathorn (2011), "hard to reach" or "hidden" populations could be explored through the snowball sampling technique because sampling such populations is challenging due to the lack of a sampling frame for choosing the sample. Therefore, the snowball technique was also utilized to get relevant knowledge about the various actors in the value chain especially equipment and software providers and small parts suppliers as no database was available with the list of all such companies.

We believe the telecom sector was a relevant context for data collection and subsequent model testing as it is a knowledge-based service sector and has a huge significance in the economy of Pakistan with 278.4 billion rupees contribution to the national exchequer in FY 2019–2020 (PTA, 2020). A list of firms was prepared by the researchers using different sources that would meet the criteria of the objectives of our research. Care was taken to identify and include firms in the Telecom sector including all the firms in the value chain. This included firms that were B2B (small parts suppliers, telecom network providers and telecom equipment suppliers) and B2C (telecom service providers). A survey questionnaire was prepared both in MS Word and online through a Survey Monkey tool. An invitation was sent to the firms through email and LinkedIn contacts. However, the majority of the firms were visited personally by the researchers to gather the data and to ensure the representativeness of all the actors in the value chain in the sample. Then, a system of references was used to approach other firms and the respondents were requested

to provide the contact details of other firms belonging to this sector which also ensured a high response rate.

So overall, three hundred finalized questionnaires were distributed among various telecom business units. Out of these two hundred and one were returned with a response rate of 67%. Initial screening was done to identify and remove any response with high missing values and the final sample size was one hundred and ninety-seven respondents. To improve the validity of the findings, data was also collected from different stakeholder groups including top managers, middle managers, and line managers as per previous literature (Buil-Carrasco et al., 2008). However, it was ensured by the researchers that the respondents who filled out the questionnaires knew of the firm-level practices. This was ensured through a question at the start of the questionnaire that requested respondents to fill the questionnaire only if they have firm related knowledge or else forward it to a knowledgeable manager.

Measures

The scales used to measure the variables were adopted from previous literature. All the items were measured on a 5-point Likert scale with 5 as strongly agree and 1 as strongly disagree. Transformational leadership was measured through the 5-item scale developed by Podsakoff *et al.* [53]. It has been reliably used as a measure of transformational leadership in previous studies e.g., Garcia-Morales et al. (2008). The sample item is "*Our leaders are capable of motivating and guiding their colleagues on the job*". Since the questionnaire was filled by respondents who worked at a managerial level, we believe that they knew the firm leader's transformational leadership styles. This is in line with previous literature that also used a manager-based survey to measure this variable (Ting et al., 2021).

The knowledge sources scale was based on the previous research of Brusoni et al. (2005) and Lin & Lin (2010). While most of the earlier studies considered only external sources of knowledge, some of the recent researchers like Volpi (2017) incorporated both internal and external sources of innovation. Therefore, we took both internal and external sources of innovation into consideration. Two of the sample items are, "*Other departments within your firm*" and "*Suppliers of equipment, materials, services, or software*".

Customer engagement was measured through the scale developed by Agarwal and Selen (2009). Four items were used to measure the construct on a 5-point Likert scale. A sample item is "*Co-opting with the customer gives us greater ability to explore opportunities*".

Absorptive capacity has been studied in literature through a uni-dimensional scale and sometimes using some proxy measures like number of patents, R&D employees divided by total employees and R&D expenditures (e.g., Rothaermel & Alexandre, 2009). Recent studies have used multi-dimensional models (Jiménez-Barrionuevo et al., 2011). The items used for our survey were taken from the scale developed by Flatten et al. (2011) as it encompasses all four dimensions of absorptive capacity. The sample item is "*Our employees have the ability to structure and to use collected knowledge*".

The majority of the studies, e.g., Vaccaro et al. (2012) studied the effect of transformational leadership on one type of innovation only. However, in our study, we have taken a holistic approach and explored four different types of innovation based on the Community Innovation Survey (CIS). They are product/service innovation, process innovation, organizational innovation, and marketing innovation. The same scale has been used by previous researchers (Mothe & Thi, 2010). The respondents were asked whether, in the last three years, their firm introduced

innovation. A sample item is **"*New or significantly improved supporting activities for your*** ***processes, such as maintenance systems or operations for purchasing, accounting, or computing*"**.

Sample

Most of the respondents of the survey were young to middle-aged professionals. The sample consisted of respondents with most professionals thirty-nine years of age or less. Most of the respondents had graduate or masters level education. The respondents of the survey were from highly diversified organizations concerning their size.

 The mean age of firms was 20.79 years where most of the firms in the sample were private and part multinational with eighty-two (48.24%) followed by local private firms forty-eight (28.24%) and lastly government firms with several forty firms with a percentage of 23.53%. Most of the firms in the sample were end-user service providers with a count of one hundred and one firms (59.41%).

Common Method and Non – response bias

To mitigate the problem of common method bias, we estimated the total explained variance using the approach recommended by MacKenzie and Podsakoff (2012). If the total explained variance is less than 50%, it suggests that this bias does not exist (Podsakoff et al., 2012; Vandenberg, 2006). Based on Harman's single factor test, the calculated total explained variance was 24.31%, indicating the absence of common method bias (Reio, 2010).

A comparison analysis was conducted using a paired t-test in the SPSS software to assess the potential impact of non-response bias in the data. This analysis compared the responses of participants who responded early with those who responded late. More precisely, the first group of 50 answers was compared to the last 50 answers in the dataset. The results showed no statistically significant disparity between the initial 50 participants who responded early and the

last 50 participants who responded late, which shows no specific bias present in the data (Greco et al., 2015).

Analysis Strategy and Results

Hypotheses were tested using the Partial Least Squares (PLS) technique, a powerful quantitative procedure used by previous studies in this field (Singh et al., 2022). PLS is an effective tool for explaining complex relationships (Sarstedt, 2008). The evaluation of the structural model in PLS-SEM involves the evaluation of the proposed relations. The measurement model shows how latent constructs were measured across their observed variables and evaluates their measurement properties. Before moving to the structural model, it is necessary to satisfy the properties of the measurement model (Fornell & Larcker, 1981). In PLS-SEM, the structural model is assessed based on three main statistics, namely the path coefficient (ß value) and bootstrap statistics (t-value and p-value).

Measurement Model

In the present study, five constructs were investigated, including transformational leadership, knowledge sourcing, customer engagement, absorptive capacity, and innovation performance. The constructs were measured using 47 items. The confirmatory factor analysis for all reflective constructs was carried out in Smart PLS 3. The evaluation of the measurement model is usually carried out to verify its reliability and validity. The model is shown in Figure 2.

Table 1(A) shows the correlation values among the model variables. No variables were highly correlated at or above the 0.7 threshold value. Tolerance and the variance inflation factor (VIF) values are explored to test the multicollinearity issue in the data. Tolerance is calculated by dividing the VIF value by one (1/VIF). VIF should be used in the range of 1 to 5 (Ringle et al.,

2015). Similarly, multicollinearity problems can arise when the tolerance value is less than 0.20 (Weisburd et al., 2014). Table 1(B) demonstrates no multicollinearity problem because all variables fall within the recommended ranges.

Table 2(A) shows the values of item loadings, composite reliability (CR) and average variance extracted (AVE). One item for absorptive capacity (ASI3) with loading less than 0.7 was removed. However, four knowledge-sourcing items (KS1, KS2, KS3, and KS6) with loadings less than 0.7 were kept since the variable met the composite reliability (CR) and average variance extracted (AVE) requirements. The work's findings, displayed in Table 2(B), showed that the RMSEA was 0.056 (less than 0.08), the $\chi2/df$ was 3.78 (less than 5), and the CFI, TLI, GFI, and AGFI were, respectively, 0.929, 0.912, 0.917, and 0.931 (all greater than 0.9). Accordingly, the measurement model's fit indices indicated a good model fit (Browne & Cudeck, 1992).

Insert Table 1(A) and 1(B) about here

Insert Table 2(A) and Table 2(B) about here

Convergent validity is tested with the help of Cronbach's alpha, composite reliability (CR) and average variance extracted (AVE) values. Table 2(A) shows Cronbach's alpha and CR values are above 0.7 and AVE above 0.5, showing an acceptable level of internal consistency and converging validity. Discriminant validity is the extent to which a variable is distinct from other variables in a research model. In this study, discriminant validity is assessed using the recently advanced HTMT criterion (Henseler et al., 2014). Table 3 shows HTMT values for variable scales. It shows that all values are lower than the required threshold value of 0.85 (Kline, 2015) thus establishing discriminant validity.

Structural Model

Table 4 shows the results of hypotheses testing and predictive power (R^2), effect sizes (f^2) and predictive relevance (Q^2). Effect sizes were established using the recommendations of Cohen (1988). The *R^2* values for absorptive capacity and innovation were 0.435 and 0.444, which are substantial values. The effect size *f^2* for the relationship between transformational leadership and innovation performance was in the range between small to medium at .001, and the effect size for transformational leadership and absorptive capacity was in the medium to large range at 0.294. The effect size for the relationships between knowledge sourcing, innovation performance and absorptive capacity was in the range between small and substantial at 0.326 and 0.058 respectively. Whereas customer engagement has a small effect on innovation and absorptive capacity at 0.103 and 0.039 respectively. For the relationship between absorptive capacity and innovation, the effect size was small at .110. The predictive relevance Q^2 of both, innovation and absorptive capacity is above zero, confirming that the model has adequate predictive relevance. The results of the PLS-SEM analysis of relationships between the latent constructs are shown in Fig. 2.

Insert Figure 2 about here

Hypotheses Testing

Table 4 shows knowledge sourcing ($\beta = 0.51$, *p*<.01) and customer engagement ($\beta = -0.26$, *p*<.01) were significantly positively related to innovation performance. Thus, our hypotheses 2 and 3 were supported. However, results indicated the relation between transformational leadership and innovation performance ($\beta = 0.02$, p>.01), not supporting H1. Although not hypothesized, the results also show a significant positive relationship between absorptive capacity and innovation

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performance (β = 0.32, p<0.01). Similarly, the results show that a positive and significant relationship exists between transformational leadership & absorptive capacity (β = 0.46, p<0.01), knowledge sourcing & absorptive capacity (β = 0.21, p<0.05) and customer engagement & absorptive capacity (β = 0.15, p<0.05).

The lower panel in Table 4 shows results for Hypotheses 4, 5 & 6, which predicted the mediating role of absorptive capacity between transformational leadership, knowledge sourcing and customer engagement. The results show support for the mediating role of absorptive capacity in the relationship between transformational leadership (β = .150, p<.01), knowledge sourcing (β = 0.070, p<.05) & customer engagement (β = .051, p<.05) and innovation performance. Thus, hypotheses 3, 4 and 5 were supported.

Insert Table 4 about here

Discussion and Implications

This paper aimed to advance our understanding of the antecedents and enablers of innovation performance in firms belonging to a knowledge-intensive service sector of a developing country, i.e., the telecom services sector in Pakistan. Utilizing dynamic capabilities, knowledge-based view and stakeholder theories, the study assessed the role of transformative leadership, knowledge sourcing and customer engagement in shaping innovation performance through the mediatory role of absorptive capacity.

Employing a sample of 197 firms operating in the telecom services sector, results showed that transformational leadership does not directly enhance innovation performance but the mediating role of absorptive capacity in this relationship was supported by the results. Previous

research has also tried to explain the impact of the interplay of leadership and absorptive capacity on open innovation outcomes and found promising results (Naqshbandi & Tabche, 2018).

Furthermore, the results revealed that knowledge sourcing from both internal and external sources influences the innovation outcomes in KIBS, both directly and through the mediation of absorptive capacity, thereby confirming the findings of Ovuakporie et al. (2021). Similarly, the role of knowledge sourcing has been discussed in the paradigm of open innovation. Open innovation has enabled firms to look outside their traditional boundaries to search for valuable information and knowledge (Scuotto et al., 2017). The use of such knowledge channels has been linked to improving the firm's capacity to acquire, assimilate and transform this knowledge to realize potential benefits to the firms. Recently, researchers have highlighted the importance of the integration of internal and external knowledge acquisition in collaborative relationships, and their role in encouraging innovation in organizations (Ardito et al., 2019; Santoro et al., 2020). In this regard, our data confirm that sourcing from both internal and external sources allows gathering and using heterogeneous types of knowledge useful to innovate in different ways (Santoro et al., 2019). We also found support for the mediating effect of absorptive capacity in the relationship between customer engagement and innovation performance, as per previous literature (Xie et al., 2021).

Theoretical Implications

This study has implications for both theory and practice. Firstly, this study utilizes the knowledge-based view, stakeholder theory and dynamic capabilities to investigate the interplay between transformational leadership, knowledge sourcing, customer engagement and absorptive capacity and their impact on innovation performance in a developing country and thus it shows

the external validity of these theories which were developed and tested in Western developed countries (Scuotto et al., 2017).

According to the dynamic capabilities of the firms, a firm's absorptive capacity has a direct and significant impact on its innovation performance through knowledge acquisition, integration and assimilation (Easterby-Smith & Prieto, 2008). Researchers argue that leveraging external knowledge might be difficult due to insufficient prior knowledge and thus organizations must build absorptive capacity. Therefore, to understand how transformational leadership, knowledge sourcing and customer engagement influence innovation, we assess the mediating role of absorptive capacity through the lens of dynamic capabilities theory.

Leadership styles have proved to be an integral part of strategy by directly and indirectly influencing innovation performance (Ahn et al., 2017). Successful innovation management involves leaders who can effectively manage human resources by encouraging their subordinates to actively participate in knowledge-based activities (Whelan et al., 2011; Bhatti et al., 2020; Papa et al., 2020). Transformational leadership inspires innovation through the effective utilization of knowledge sources and thus enhances organizational performance as per the knowledge-based view of the firm (Howell & Avolio, 1993).

Furthermore, stakeholder theory stresses the need to involve different types of stakeholders in value creation (Santoro et al., 2020). Similarly engaging internal and external customers has proved to be crucial in the process of open innovation where customers can play an integral role in idea generation (Xie et al., 2021) however previous researchers found mixed results on the role of customer involvement in innovation (Storey & Larbig, 2018). Nambisan (2018) maintained that customers play a dual role in the value creation processes of the organizations, that is as a co-

In this regard, we investigated the role customer engagement plays in service, product, management, and marketing innovation. We thus extend the literature on stakeholder theory by exploring and establishing the role users play in different types of innovation and how they help in the capacity building of the firms of KIBS.

Where most of the previous literature on open innovation focused on manufacturing as compared to the services sector, we filled this gap with a comprehensive model of innovation in KIBS. In this regard, we assessed the role of transformational leadership, knowledge sourcing and customer engagement in increasing innovation performance. These factors have been identified previously by researchers as acute for open innovation; however, we proposed and tested a comprehensive open innovation model, particularly in the knowledge-based service firms in a developing country, which, to the best of our knowledge, has not been done so far.

Finally, since we measured innovation performance referring to product/service innovation, process innovation, management innovation and marketing innovation, we can contribute to the literature showing the greater benefits of knowledge-sourcing strategies. Thus, an integrative measure of innovation performance including four different forms of innovation namely product, process, management, and marketing innovation in this study qualifies as a methodological contribution. In fact, previous studies have used different proxies of innovation performance, mostly limiting the scope to just patents or product innovation performance.

Managerial Implications

This insight is particularly meaningful for firms in developing countries, which usually have weaker infrastructure and low support. The Telecommunications sector is perhaps the most volatile

industry that is particularly known to have a history of important changes and disruptions (Rohrbeck et al., 2009). Telecom is a technology-intensive sector, it is composed of complex inter-related technological systems, and services are increasingly being tailored to specific customer needs, usually in the form of a bundle of services and there is a lot of potential for more innovative services to be offered (Lindmark et al., 2004). For these reasons, managers must understand that knowledge sourcing strategies are vital for acquiring valuable information about changes and reshaping resources, technologies, and business models. Our research focuses specifically on Pakistan's telecom sector and offers deep insights crucial for understanding the impact of this industry's distinct regulatory and market dynamics. These observations can be particularly valuable for stakeholders and policymakers operating in similar environments.

The results of this study have established the importance of transformative leadership and its role in improving the innovation of organizations through improving absorptive capacity. This stresses the importance of absorptive capacity in translating the impact of this leadership style on innovation. Previously, researchers have also stressed that transformational leadership can play a critical role in building organizational capabilities (Del Giudice et al., 2020). Since managers' perceptions of the style of leadership highly impact the promotion of such behaviour among their followers (Fowler & O'Gorman, 2005), top management must promote such leadership characteristics in their managers including absorptive capacity development training.

Accordingly, we suggest managers can use this model to improve innovation performance, especially in developing countries. In the specific context of knowledge-intensive business services, we stress that managers must be challenged to undertake these three considerations. First, by inculcating leadership qualities and by creating an open knowledge environment, they can improve the efficiency of innovation and can play a critical part in firm survivability. The second

one concerns knowledge and creativity exploration with both internal and external sources of knowledge and the third is to engage their customers and/or end users by establishing good communication channels and processes.

Conclusion, Limitations Future Work

The research contributes to the open innovation and knowledge management literature as the results show that while knowledge sourcing and customer engagement directly impact innovation performance; transformational leadership, knowledge sourcing and customer engagement all impact the innovation performance of firms through the mediating effect of absorptive capacity. In other terms, absorptive capacity is vital for benefiting from transformational leadership, knowledge sourcing and customer engagement in terms of better innovation performance.

Despite its benefits, the current research has some limitations as well. First, this research establishes that the open innovation strategy of knowledge sourcing from internal and external sources is related to innovation performance but does not explain in detail which source exerts a higher impact on performance. Future research can explore this question in detail (Santoro et al., 2020). Second, this model does not explore which strategies can be adopted to facilitate the absorption of internal and external knowledge. Since context plays an important role in such relationships, it would be interesting to make a comparative analysis of our model between two or more countries. Our work can provide a basis for future comparative research in this field of study. Researchers can utilise our findings as a foundation for doing cross-sectoral or cross-country analyses, hence expanding the range and relevance of the research.

Third, existing scales were used to measure the constructs and their relationship. However, due to the complex nature of some of the constructs, e.g., innovation performance in KIBS, future researchers might endeavor to develop more relevant scales that take into consideration the specific characteristics of such firms and test our model to validate it. Finally, the paper focuses on the role of transformational leadership, knowledge sourcing and customer engagement in increasing innovation performance. Future studies could explore additional moderating and mediating factors affecting these relationships e.g., environmental factors like technological dynamism and uncertainties.

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TABLE 1(A)

Correlations

	IP	AC	TL	KS	CE
IP	1				
AC	.474**	1			
TL	.356**	.595**	1		
KS	.541**	.451**	.416**	1	
CE	.055	.376**	.308**	.400**	1

IP = Innovation Performance, AC = Absorptive Capacity, TL =Transformational Leadership,

KS=Knowledge Sourcing, CE=Customer Engagement, **Correlations are sig at 0.01 level

TABLE 1(B)

Multicollinearity Test

Variables	VIF	Tolerance
Transformational leadership	3.18	0.3145
Knowledge sourcing	2.75	0.3636
Customer engagement	3.54	0.2825
Absorptive capacity	1.98	0.5051
Innovation performance	2.32	0.4310

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TABLE 2(A)

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Item Loadings, Cronbach's alpha, Composite Reliability and Average Variance Extracted

Variables	Items	Loadings	α	CR	AVE
Transformational Leadership	TL1	0.812	0.875	0.909	0.667
	TL2	0.816			
	TL3	0.809			
	TL4	0.841			
	TL5	0.803			
Knowledge Sourcing	KS1	0.671	0.937	0.945	0.550
	KS10	0.815			
	KS11	0.782			
	KS12	0.714			
	KS13	0.747			
	KS14	0.746			
	KS2	0.688			
	KS3	0.682			
	KS4	0.707			
	KS5	0.747			
	KS6	0.693			
	KS7	0.832			
	KS8	0.752			
	KS9	0.788			
Absorptive Capacity	ACQ1	0.738	0.949	0.955	0.620
	ACQ2	0.755			
	ACQ3	0.784			
	ASI1	0.781			
	ASI2	0.761			
	ASI4	0.834			
	EXP1	0.807			
	EXP2	0.799			
	EXP3	0.754			
	TRAN1	0.841			
	TRAN2	0.842			
	TRAN3	0.742			
	TRAN4	0.748			
Innovation Performance	ProdInn	0.828	0.935	0.944	0.608
	ProcInn1	0.773			
	ProcInn2	0.779			
	ProcInn3	0.824			
	ManInn1	0.792			

	ManInn2	0.779			
	MannInn3	0.814			
	MarInn1	0.769			
	MarInn2	0.746			
	MarInn3	0.749			
	MarInn4	0.714			
Customer Engagement	CE1	0.762	0.918	0.943	0.807
	CE2	0.949			
	CE3	0.937			
	CE4	0.931			

Table 2(B) Model FIT

Factors	Values (After CFA)
Chi-square/Df	3.78
AGFI	0.931
GFI	0.917
RMSEA	0.056
TLI	0.912
CFI	0.929

TABLE 3

Heterotrait -Monotrait Ratio (HTMT)

	1	2	3	4	5
1. Absorptive Capacity	-				
2. Customer Engagement	0.399				
3. Innovation Performance	0.505	0.080			
4. Knowledge Sourcing	0.480	0.433	0.580		
5. Transformational Leadership	0.651	0.349	0.396	0.462	-

TABLE 4

Std. Beta, Std. Error, T-Statistic, R², F² and Q²

	Std Beta	Std Error	t-statistic	R²	f²	Q²
Transformational Leadership -> Absorptive Capacity	.46	.072	6.37**	.435	.294	.248
Knowledge sourcing-> Absorptive Capacity	.21	.087	2.41*		.058	
Customer Engagement -> Absorptive Capacity	.15	.065	2.45*		.039	
Knowledge sourcing -> Innovation performance	.51	.065	7.75**	.444	.326	.247
Transformational Leadership -> Innovation performance	.02	.082	0.28		.001	
Customer Engagement-> Innovation performance	-.26	.061	4.47**		.103	
Absorptive capacity -> Innovation performance	.32	.083	4.02**		.110	
Mediation						
Knowledge sourcing -> absorptive capacity -> Innovation performance	.070	.035	2.011*			
Transformational Leadership -> absorptive capacity -> Innovation performance	.150	.043	3.517**			
Customer engagement -> absorptive capacity -> innovation performance	.051	.026	2.059*			

**p<.01, *p<.05; Effect size is determined using the guidelines of Cohen (1988); 0.02 = small, 0.15 = medium, 0.35 = large
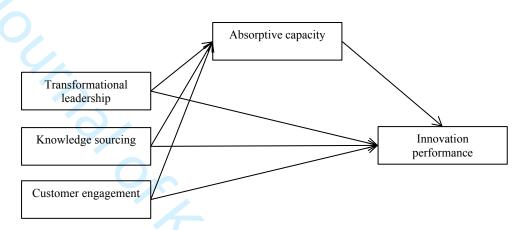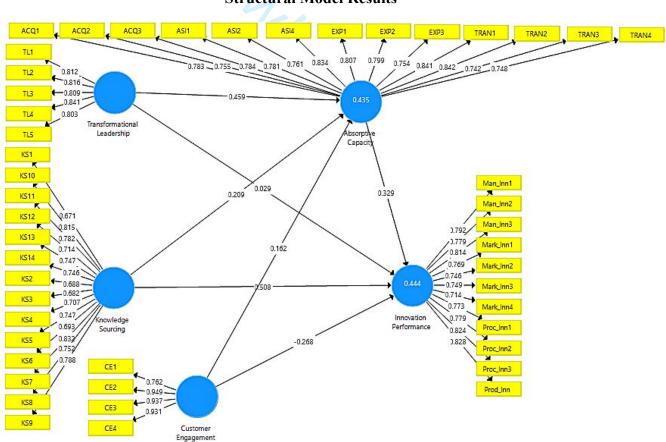
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FIGURE 1

Research Model

FIGURE 2

Structural Model Results

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Manuscript ID JKM-11-2023-1055.R1 entitled "How do knowledge-intensive business services improve innovation? A Resource-based model for antecedents of innovation in a developing country"

Dear Editor and Anonymous Reviewers,

We thank you for giving us this opportunity to improve our manuscript and submit it again for your consideration. We have incorporated all the suggestions provided by the editor and both the anonymous reviewers. We have prepared a detailed reply to the comments and hopefully, you will find our manuscript significantly improved now.

Regards,
The Authors.

Reviewer(s)' Comments to Author:
Reviewer: 1
Recommendation: Minor Revision

Comments:
Dear Authors,

Thank you for the rigorous and committed effort you have put into addressing the comments on your manuscript. It is clear that the paper has been significantly improved as a result. Despite these improvements, I believe that further, mostly minor and marginal, modifications are necessary to make the paper publishable.

Reply: We appreciate your approval of our changes in this round of review. We further reply to your comments in the sections below.

1) The abstract has been restructured. Currently, however, it appears too lengthy. Please try to shorten it, ensuring that the core message of each section is conveyed correctly. For the

appropriate length of the abstract, refer to the journal's guidelines and draw inspiration from papers recently published.

Reply: Thanks for your comment. We have reduced the length of the abstract and retained only the critical information regarding the paper. Now the abstract is within the word limit of the journal.

2) The introduction has also been improved but is a bit lengthy. In this regard, I suggest removing the definition of absorptive capacity, especially since it is then included again in the development of the hypotheses. Additionally, the contributions could be summarized to be explained better in the conclusions.

Reply: Thanks for the suggestion. We have reduced the overall length of the Introduction. As per your suggestion, we have taken the definitions of the variables and shifted some information into the theoretical / conclusion sections. I hope you find this section much more precise now.

3) Clarity is needed regarding the role of customer engagement. Specifically, do the companies in the sample operate in a B2C or B2B context? This should be included in the discussion of the role of customer engagement.

Reply: Thank you very much for pointing out this insightful observation. The firms were selected from the value chain of a knowledge-based technical sector, i.e., the Telecom sector. Since representatives of the whole value chain were a part of the sample frame, the companies chosen were both B2B and B2C and thus the term "customers" was used in the manuscript instead of "end user" to truly represent the sampling characteristics. This has been added in the methods section.

These adjustments will further refine your work and enhance its suitability for publication in our journal. We appreciate your dedication to enhancing the manuscript and look forward to reviewing the revised version.

Reply: Thanks for your detailed comments and suggestions. We hope you find our manuscript much improved now.

Additional Questions:

1. Originality: Does the paper contain new and significant information adequate to justify publication?: See comments

2. Relationship to Literature: Does the paper demonstrate an adequate understanding of the relevant literature in the field and cite an appropriate range of literature sources? Is any significant work ignored?: See comments

3. Methodology: Is the paper's argument built on an appropriate base of theory, concepts, or other ideas? Has the research or equivalent intellectual work on which the paper is based been well designed? Are the methods employed appropriate?: See comments

4. Results: Are results presented clearly and analysed appropriately? Do the conclusions adequately tie together the other elements of the paper?: See comments

5. Implications for research, practice and/or society: Does the paper identify clearly any implications for research, practice and/or society? Does the paper bridge the gap between theory and practice? How can the research be used in practice (economic and commercial impact), in teaching, to influence public policy, in research (contributing to the body of knowledge)? What is the impact upon society (influencing public attitudes, affecting quality of life)? Are these implications consistent with the findings and conclusions of the paper?: See comments

6. Quality of Communication: Does the paper clearly express its case, measured against the technical language of the field and the expected knowledge of the journal's readership? Has attention been paid to the clarity of expression and readability, such as sentence structure, jargon use, acronyms, etc.: See comments

Reply: We appreciate your valuable feedback, and we believe that our manuscript has been significantly improved due to the suggestions provided by the reviewers.

Reviewer: 2

Recommendation: Minor Revision

Comments:

Dear Authors,

Your manuscript provides an important contribution to the field of open innovation in developing countries, specifically examining the telecom services sector in Pakistan. The article is well-structured, with clear definitions of key concepts and a solid argument that aligns well with the proposed research objectives. However, I recommend considering the suggestions I attached to provide further clarity and consistency to your manuscript.

Reply: Thanks for your comprehensive comments. We reply to your comments below in detail.

Additional Questions:

1. Originality: Does the paper contain new and significant information adequate to justify publication?: The paper presents a significant contribution to the understanding of open innovation in the context of developing economies, particularly through the exploration of knowledge-intensive business services in the telecom sector of Pakistan. It addresses a gap in existing research by focusing on a less-studied economic setting and incorporating factors like transformational leadership, customer engagement, and knowledge sourcing as enablers of innovation.

Reply: Thank you very much for appreciating the research gap addressed by our study.

2. Relationship to Literature: Does the paper demonstrate an adequate understanding of the relevant literature in the field and cite an appropriate range of literature sources? Is any significant work ignored?: The paper demonstrates a comprehensive and in-depth engagement with the relevant literature, which supports its theoretical and empirical framework. However, here I list here some studies that may be helpful for your research:

• Papa, A., Dezi, L., Gregori, G. L., Mueller, J., & Miglietta, N. (2020). Improving innovation performance through knowledge acquisition: the moderating role of employee retention and human resource management practices. Journal of Knowledge Management, 24(3), 589-605.

• Caputo, F., Magni, D., Papa, A., & Corsi, C. (2021). Knowledge hiding in socioeconomic

settings: matching organizational and environmental antecedents. Journal of Business Research, 135, 19-27.

• Santoro, G., Bresciani, S., & Papa, A. (2020). Collaborative modes with cultural and creative industries and innovation performance: the moderating role of heterogeneous sources of knowledge and absorptive capacity. Technovation, 92, 102040.

• Hussain, N., Bhatti, W. A., Khan, S. A., Arslan, A., & Tarba, S. Y. (2022). Firm absorptive capacity: multidimensionality, drivers and contextual conditions. Journal of Knowledge Management, 26(10), 2718-2742.

• Kapoor, M., & Aggarwal, V. (2021). Comprehending a knowledge framework as a source of dynamic capabilities in IJVs through PLS-SEM. Journal of knowledge Management, 25(4), 920-942.

Reply: Thank you very much for suggesting these relevant and recent studies. We have incorporated these studies in our manuscript. These have not only helped us in improving our literature review but have also strengthened our research gap and significance.

3. Methodology: Is the paper's argument built on an appropriate base of theory, concepts, or other ideas? Has the research or equivalent intellectual work on which the paper is based been well designed? Are the methods employed appropriate?: Overall, the methodology section of the paper is well-constructed, with clear justifications and explanations that adhere to rigorous academic standards, enhancing the paper's credibility and the robustness of its findings.

However, here are some areas where criticism might be applicable, which could be related to the scope, sample, data collection, and analysis methods.

-Sample Representativeness and Size:

• While the sample may be adequate for structural equation modeling, concerns may arise regarding its representativeness across the broader telecom sector in Pakistan. If the sample primarily consists of larger telecom operators, the results might not generalize to smaller or medium-sized enterprises which could have different innovation capabilities and resources.

Reply: We thank you for this comment. The telecom value chain was selected as a sampling frame for testing our proposed model. The value chain consisted of small parts suppliers, telecom network providers, and solution providers. Hence a variety of organizations (both small and large organizations were a part of the sample. We acknowledge that our sample

largely consists of larger telecom operators, which may limit the generalizability of the results to smaller or medium-sized enterprises (SMEs). However, our sampling process was designed to capture a significant portion of the market by focusing on key players within the telecom sector. Larger operators were selected due to their substantial market share, extensive customer base, and critical role in driving innovation within the industry. These telecom operators often lead the way in adopting and implementing innovative practices due to their greater resources and capabilities. Studying these entities provides valuable insights into the innovation dynamics of the other firms.

• The specific number of participants and response rate are not detailed, which might raise questions about the statistical power of the study and the potential for non-response bias.

Reply: Thank you for your valuable feedback, the number of participants and response rate are now improved and added to the manuscript and marked as yellow highlighted. Furthermore, the non-response bias test that was previously missed is now added to the manuscript.

-Single Industry and Geographic Focus:

• Focusing exclusively on the telecom sector in one developing country limits the generalizability of the findings to other sectors or geographic contexts. The unique regulatory and market dynamics of the telecom industry in Pakistan may not necessarily reflect those in other service sectors or in other developing economies.

Reply: We appreciate your feedback. We acknowledge that focusing exclusively on the telecom sector in Pakistan may limit the generalizability of our findings to other sectors or geographic contexts. However, our study provides substantial worth in multiple aspects:

- Our research focuses specifically on Pakistan's telecom sector and offers deep insights that are crucial for understanding the impact of the distinct regulatory and market dynamics of this industry. These observations can be particularly valuable for stakeholders and policymakers operating in similar environments.
- Our work can provide a basis for future comparative research in this field. Researchers can utilise our findings as a foundation for doing cross-sectoral or cross-country analyses, hence expanding the range and relevance of the research.

- Although the specific findings may be limited to a particular context, the frameworks, procedures, and analytical approaches we have created can be modified and utilised in many sectors and economies that are in the process of development.

4. Results: Are results presented clearly and analysed appropriately? Do the conclusions adequately tie together the other elements of the paper?: The findings seem to be appropriately analyzed and interpreted within the context of the study's theoretical framework and research aims. The use of structural equation modeling (SEM) provides a robust analytical technique suitable for examining the complex relationships and interdependencies among the various constructs. However, here are some areas which could be improved.

- Clarity and Accessibility: The structuring of SEM results requires clear presentation, including diagrams of the model with standardized coefficients, significance levels, and goodness-of-fit indices. If these elements are not well-presented or are overly technical without sufficient explanation, it could limit the accessibility and usefulness of the findings to the intended audience.

Reply: Thank you for the feedback, the diagram of the SEM is included in the manuscript as Figure 2 along with its standardised co-efficient and significance levels. Additionally, the model fit is now calculated and added in the manuscript as Table 2(B)

- Data Handling and Reporting: The analysis section should also transparently report how missing data, outliers, and multicollinearity were handled. Lack of such details can raise questions about the robustness of the analysis.

Reply: Thank you for the suggestions, the test for missing values was computed before the start of the analysis. Additionally, the test of outlier and multicollinearity is now added to the manuscript.

5. Implications for research, practice and/or society: Does the paper identify clearly any implications for research, practice and/or society? Does the paper bridge the gap between theory and practice? How can the research be used in practice (economic and commercial impact), in teaching, to influence public policy, in research (contributing to the body of knowledge)? What is the impact upon society (influencing public attitudes, affecting quality of life)? Are these implications consistent with the findings and conclusions of the paper?:

The paper aims to contribute to the body of knowledge by exploring open innovation in a developing country's telecom sector, which may offer new insights due to the unique challenges and opportunities in such contexts. While the study seems to aim at improving managerial practices through insights into innovation drivers and barriers, it must clearly outline how these findings can be operationalized by managers. Without practical steps or clear guidelines, the real-world applicability of the research could be limited, undermining its value for practitioners.

Reply: We are sorry for missing out on this important point in the managerial implications. We have added discussion as to how our study may help managers in this important sector. Please see below a sample of the changes made in this section.

"Accordingly, we suggest managers can use this model to improve innovation performance, especially in developing countries. In the specific context of knowledge-intensive business services, we stress that managers must be challenged to undertake these three considerations. First, by inculcating leadership qualities and by creating an open knowledge environment, they can improve the efficiency of innovation and can play a critical part in firm survivability. The second one concerns knowledge and creativity exploration with both internal and external sources of knowledge and the third is to engage their customers and/or end users by establishing good communication channels and processes."

6. Quality of Communication: Does the paper clearly express its case, measured against the technical language of the field and the expected knowledge of the journal's readership? Has attention been paid to the clarity of expression and readability, such as sentence structure, jargon use, acronyms, etc.: The manuscript provides clear definitions of key concepts and maintains an academic tone throughout, which is suitable for its intended audience. The use of industry-specific jargon is balanced with explanations, which is beneficial for ensuring the clarity of complex concepts. The manuscript follows a logical flow, starting with an introduction to the topic, followed by a detailed literature review, methodology, results, discussion, and conclusion. This structured approach is typical for academic research papers and helps in maintaining a coherent narrative.

Reply: We thank you for appreciating our efforts in maintaining a fair quality of communication in our manuscript and thanks once again for your beneficial comments in improving the overall quality of the paper.