Determinants of Innovation Capability: Knowledge Sharing Perspective in the context of Small and Medium Enterprises

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Abstract

The basic aim of this study is to determine the key determinants of innovation capability. In addition to determination of key determinants of innovation capability, it also provided deeper understanding about the mediating effect of knowledge sharing on key determinants of innovation capability. It further unfolds the direct impact of knowledge sharing on innovation capabilities in context of small and medium enterprises. The paper used structural equation modeling to test hypotheses by using data collected from 91 manufacturing Small and Medium Enterprises (SMEs) registered at Hattar Industrialist Association (HIA), Industrial Estate, Khyber Pakhtunkhwa, Pakistan. The key findings indicate that technological capabilities, transactional capabilities and knowledge sharing are statistically significant determinants of innovation capabilities of SMEs of Pakistan. Furthermore, knowledge sharing has significant mediating effect on technological capabilities and innovation capabilities in context of SMEs of Pakistan and knowledge sharing has significant positive impact on innovation capabilities. The paper provides key insights to Small and Medium Enterprises Development Authority (SMEDA), Government of Pakistan to focus on development of SME sector by initiating key interventions that enables them to develop the innovation capabilities by focusing on development of technological and intellectual infrastructure for SMEs in Pakistan. Policy makers may use the findings of this study for the purpose of development innovation friendly policies for SMEs of Pakistan. Financial institutions like commercial banks may consider these findings for designing financing products for SMEs of Pakistan. Future studies can be conducted while enhancing the sample size and including the SMEs from services-oriented industry to have better look on determinants of innovation capability as service industry is getting significant place in knowledge economies.

Keywords: innovation capabilities, technological capabilities, operational capabilities, managerial capabilities, transactional capabilities, knowledge sharing

Introduction

Firms in almost all sectors of economy at all levels are developing culture of innovation for their ultimate success in markets. Intellectual discussion around the concept of innovation has concentrated on the idea of innovation capability (Calantone, Cavusgil et al. 2002). Firm's innovation capability has been considered as one of the important means

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for maintaining and sustaining competitive advantage and sustainable performance (Colino, Benito-Osorio et al. 2014, Liao, Hu et al. 2017, Le and Lei 2018). Innovation Capability is an ability of firm to precede innovative processes which results innovation in products, services, procedures and processes of the firm (Lawson and Samson 2001).

The concept of innovation capability has been defined in various ways; like it is defined as the accessibility to the set of physical and intellectual resources, structures and processes which are used to solve core organizational issues and problems (Laforet 2011). Innovation capability is also defined as facilitator and enabler to innovation in firms (Akman and Yilmaz 2008). It has been defined as an ability of firm to think innovatively and produce innovative ideas which have significant economic value (Elmquist and Le Masson 2009, Wonglimpiyarat 2010). Innovation capability is further defined as a capacity of firm to transform innovative ideas into products or services which can acquire registered intellectual property rights in the form of patents and have marketable value (Ngah and Ibrahim 2011). The concept of innovation capability is further elaborated by identifying that firm needs mix of several capabilities and capacities to perform core activities of firm for its survival and growth in competitive business environment (Zawislak, Cherubini Alves et al. 2012). These capabilities include managerial capabilities, technological capabilities, operational capabilities and transactional capabilities and are presented in Figure 01.

Innovation capability is also defined as an ability of firm to transform intellectual and innovative ideas and knowledge into viable products, processes, procedures and systems for ultimate benefits of firm and its relevant stakeholders (Lawson and Samson 2001). They further elaborated that innovation capability is highly essential to small and medium enterprises (SMEs) aiming to compete with their larger counter parts who have more resources and expertise. Despite the availability of rigorous and multi-dimensional literature on innovation capability, there are no specific studies pertaining to small and medium enterprises (SMEs) in context of Pakistan which could provide insights about potential determinants of innovation capability and mediating and direct effect of knowledge sharing on innovation capability, hence this study will fulfill the population gap as well as knowledge gap in context of Small and Medium Enterprises (SMEs).

Previous studies have classified innovation capability as a specific form of innovation, for example process and product innovation, whereas, some studies classify it as either radical innovation capability or incremental innovation capability. Majority of firms tries to identify

suitable source of innovation but they are in struggling phase to become successful innovators (Le, Lei et al. 2020). In this context, there is dire need to study key determinants of innovation capability in context of SMEs of Pakistan.

Prior studies suggested that managerial, technological, operational and transactional capabilities are key determinants of innovation capability in context of small businesses (Zawislak, Cherubini Alves et al. 2012). They further stated that managerial, technological, operational and transactional capabilities are positively associated with innovation capability of small firms. Despite of having key findings of Zawislak et al, (2012), there exist theoretical and empirical gap in literature in context of study of mediating effect of knowledge sharing among small firms, which needs to be studied and explored (Jia, Chen et al. 2018, Le and Lei 2018, Le, Lei et al. 2020).

In order to fill the theoretical and population gaps identified above, this study was done to answer following key research questions;

Research Question No. 01. Which are the key determinants of innovation capability out of managerial, technological, operational and transactional capabilities and what is their impact on innovation capability?

Research Question No. 02. Does knowledge sharing have mediating effect on key determinants of innovation capability and innovation capability itself as identified in Research Question No. 01?

Research Question No. 03. Does knowledge sharing have significant direct impact on innovation capability?

In order to provide answers to the stated research questions, this paper is structured as follows; section "Literature Review" presents core researchers relevant to research topic under consideration and which concludes with "Research Framework" and proposed "Research Hypotheses". "Research Methodology" section includes the research method and approach adopted to test hypotheses and to answer research questions. Section "Findings" includes key results produced after data analysis and their subsequent discussion on them and Section "Conclusion" concludes the entire research by providing key directions and insights on the basis of results and their discussion. It also provides guideline for potential future research and limitations.

Literature Review

There is great deal of literature on innovation capability and its key determinants. The constructs of innovation and innovation capability is subjective to multiple mediating factors, no research has been able to provide a conclusive argument about which competencies are crucial for enhancing innovation capability and firm's performance. Instead, research reveals that a number of capabilities are useful for firm under different circumstances. However, an analysis of the innovation capability literature reveals that the majority of researchers agree that technological capabilities, operational capabilities, managerial capabilities and transactional capabilities are the most primary and important capabilities of an organization and are key determinants of innovation capability (Guan and Ma 2003, Wang, Lo et al. 2008, Zawislak, Larentis et al. 2009, Yam, Lo et al. 2011, Zawislak, Cherubini Alves et al. 2012). Literature review of all key variables is presented here.

Technological Capability

Technological capability of firms has a twofold definition; first, it is used to define the technical ability of the firm, like integration of technical skills, resources and abilities with an ultimate objective of utilizing them for effective use of technological knowledge (Dahlman, Ross-Larson et al. 1985, Colovic and Williams 2020). Second dimension of the definition of technological capabilities refers to the structures and processes of a firm which enable them to come up with change and innovation resulting in achievement of firm goals effectively and efficiently (Ilmudeen, Bao et al. 2020). Technological capabilities of firm are reflected by its capacity to use their technological resources in its operations for the purpose of innovation and attracting investments (Zawislak, Cherubini Alves et al. 2012, Chen, Wang et al. 2020). It is further reflected as a capacity of firm to use its resources. Technological capability of firm is the capacity of firm to use its technical resources (Zawislak, Cherubini Alves et al. 2012). To summarize, this research focused upon the role of technological capabilities in development of innovation capabilities in context of small and medium enterprises.

Operational Capability

The operational capability of the firm is defined as the firm's ability to efficiently produce firm's products or services in accordance with the firm's strategy (Meissner, Burton et al. 2020). Furthermore, operational capability is also defined as the capacity of firm to produce its products or deliver its services within its parameters of cost, time and scope (Kotlar, De Massis et al. 2020). Almost all manufacturing firms

have their production and operations department, whose primary goal is to produce products by utilizing factors of production efficiently; this effective usage of factors of production is the reflection of operational capability of firms (Salisu and Bakar 2020). Operational capability of firms is reflected in the capacity of firm to fulfill customers' needs (Iranmanesh, Kumar et al. 2020). Hence, technological and operational capabilities of the firm are both critical factors in innovation capability. However, the management capability of a firm is needed in order to manage, integrate, and coordinate these capabilities in an effective manner.

Managerial Capability

The role of the manager came to the forefront of the business landscape in the 1950s, when big corporations started to emerge. Notable academicians highlighted and defined the role, characteristics and functions of a manager in the modern business organization (Tannenbaum 1949, Litzinger and Schaefer 1966, Mintzberg and Crainer 1973). However, modern management has come far from the traditional roles of the manager and the traditional management theories. There are many acceptable theories and methods of management in the business world; from transformational to transactional, servant to charismatic, and situational to team-oriented leadership models. However, the essence of all these managerial styles is to integrate and coordinate the productive capabilities of human and physical resources within the firm (Zawislak, Larentis et al. 2009, Zawislak, Cherubini Alves et al. 2012). The management capability of a firm is of paramount importance because managers often need to make quick strategic decisions on the basis of ever-changing business situations and needs. Hence, an organizations managerial capability is reflected by the wide variety of skills, resources, and experiences that its management possesses which enables it to make profitable decisions (Langlois 2003, Nasiri, Ukko et al. 2020). To summarize, this research focused upon the role of managerial capabilities in development of innovation capabilities in context of small and medium enterprises.

Transactional Capability

The purpose of an organization is to sell the products and services it has produced using technological, operational and managerial capabilities. The ability of an organization to sell its products and services profitability in the commercial market is defined as its transactional capability (Mayer and Salomon 2006). The transaction ability of the firm

embodies its abilities to facilitate the transaction of its products in a way which minimizes marketing, delivery and bargaining costs (Schreiber, Tometich et al. 2020).

It's the knowledge of the organization about its consumers, markets, delivery channels, supply chains and the processes so to decrease its transaction cost and maximize utility for the firm (Zawislak, Cherubini Alves et al. 2012). Some organizations produce innovative products well before their competitors however a lack of transaction capabilities cause the products to fail in the market. Thus, transaction capabilities are extremely necessary for the organization to be profitable (Teixeira, Puffal et al. 2020). These four capabilities of firm; technological, operational, managerial, and transactional capabilities are integrated to reflect the innovation capabilities of the firm. Research revealed that all business organizations have these four capabilities in some combination and innovation stems from the efficient utilization of these capabilities. Furthermore, research considers these four capabilities to be the pre-requisite of innovation in any organization, he argues that firms who have these four capabilities are able to develop, create and manage innovative processes, products and services in all aspects of the business which ultimately enhances firm performance (Zawislak, Cherubini Alves et al. 2012, Hock-Doepgen, Clauss et al. 2020). Figure represents the composition of innovation capability with respect to this framework.

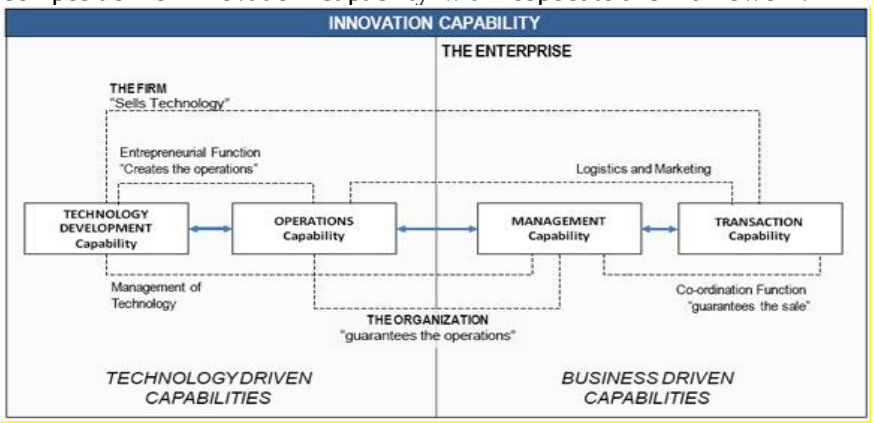


Figure No. 01: The Innovation Capability Framework by (Zawislak, Cherubini Alves et al. 2012)

Knowledge Sharing

Literature defines knowledge sharing as a process of exchanging and sharing intellectual knowledge, experience and good business practices among employees that helps them to achieve their personal and organizational objectives (Van Den Hooff and De Ridder 2004, Hsu and

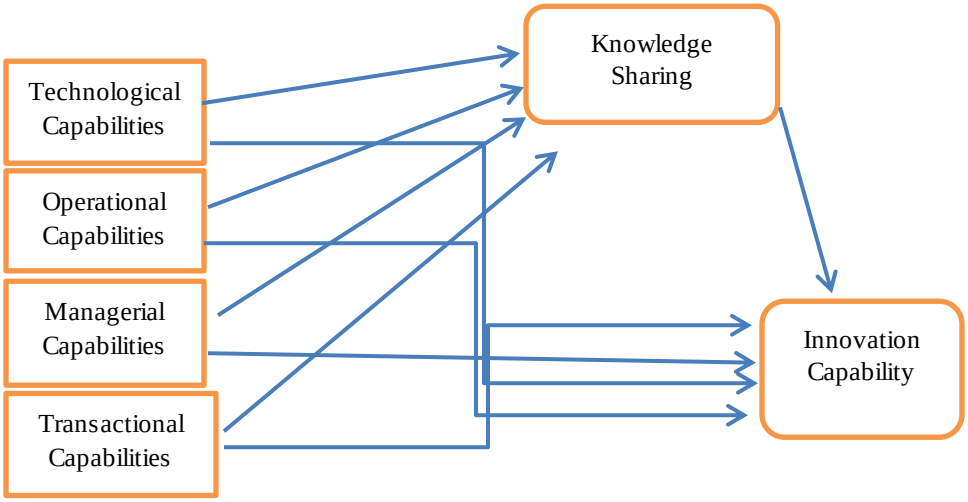
Lin 2008, Pangil and Mohd Nasurdin 2008, Ahmed, Ahmad et al. 2019, Punpukdee 2020). Knowledge management capabilities and knowledge sharing practices are critical for success of organizations (Carneiro 2000, Le and Lei 2017, Le and Lei 2018, Gerpott, Fasbender et al. 2020, Le, Lei et al. 2020). Accordingly, organizations always try to proceed with identification, collection, sharing and application of knowledge for the purpose of making that knowledge into competitive outcomes of the organizations and knowledge sharing has important role in this regard (Abukhait, Bani-Melhem et al. 2019, Al-Kurdi, El-Haddadeh et al. 2020, Bogers, Chesbrough et al. 2020, Phong and Son 2020). Culture of knowledge sharing practices in organizations help to individuals to work in a better way and achieve organizational objectives (Le and Lei 2017).

Innovation capabilities have significant influence on employee's knowledge sharing behaviors (Yao, Crupi et al. 2020). It is crystal clear that capability of transforming the knowledge into practice determines real degree of firm's innovation. Knowledge sharing behavior among employees enables firms to have good innovation capabilities (Jantunen, Puumalainen et al. 2005, Bleady, Ali et al. 2018, Jantunen, Tarkiainen et al. 2018, Teece 2020). Empirical research has further suggested that knowledge sharing has significant positive effect on innovation capabilities in knowledge intensive industries of Taiwan (Liao, Fei et al. 2007, Liao, Hu et al. 2017, Liao, Qiu et al. 2020). Level of innovation capability is decided by the practice of sharing knowledge, skills and experience by employees (Wang, Lo et al. 2008, Wang and Noe 2010, Wang and Wang 2012, Ode and Ayavoo 2020). Knowledge sharing is positively and significantly associated with firm's innovation capabilities in 162 manufacturing concerns in Malaysia (Hung, Kuo et al. 2013). Literature further reveals that by sharing skills and expertise with peers, it creates handsome number of opportunities that leads to enhance organizational innovation capabilities (Choi, Kim et al. 2016, Choi, Chung et al. 2020). In Chinese firms, knowledge sharing significantly affects innovation capabilities (Le and Lei 2018).

Empirical evidence is available showing positive association of knowledge sharing and innovation capabilities, however, empirical studies on how knowledge sharing is associated with key determinants of innovation capability is still missing (Le and Lei 2018, Watts, Steele et al. 2020). In this context, digging out moderating and direct role of knowledge sharing towards innovation capabilities and its key determinants is very important. In order to better understand the importance of innovation capability, its key determinants and direct as well as moderating effect of perceived organizational support and

knowledge sharing, the following research framework has been proposed based on literature review.

Research Framework



In context of literature review and proposed research framework, following are the hypotheses of the study under consideration;

1. *Technological Capability is statistically significant determinant of Innovation Capability*
2. *Operational Capability is statistically significant determinant of Innovation Capability*
3. *Managerial Capability is statistically significant determinant of Innovation Capability*
4. *Transactional Capability is statistically significant determinant of Innovation Capability*
5. *Knowledge Sharing is significantly mediating between technological capabilities and Innovation Capability*
6. *Knowledge Sharing is significantly mediating between operational capabilities and Innovation Capability*
7. *Knowledge Sharing is significantly mediating between managerial capabilities and Innovation Capability*
8. *Knowledge Sharing is significantly mediating between transactional capabilities and Innovation Capability*
9. *Knowledge Sharing has significant impact on Innovation Capability*

Research Methodology

Sample and Data Collection

The study used survey method for collection of the primary data by using structured questionnaire. In order to select the participants, we approached Hattar Industrialist Association (HIA), Hattar Industrial Estate, Khyber Pakhtunkhwa, Pakistan which have 152 registered industrial manufacturing SMEs. In order to meet the requirements of our research study, the respondents in our research need to be the real owner or any key employee who can represent owner as a leader who leads administration, research and development, accounts, finance and budget, production and operations departments and sales department to make it sure that he/she have relevant information about firms' strategies pertaining to innovation. Out of 152 registered industrial manufacturing SMEs with Hattar Industrialist Association (HIA), we approached all of them in December 2019 by personal visits and distributed 152 questionnaires and 91 responses were received. Response rate was of 59.86% as 91 valid responses were received out of 152 distributed questionnaires. The study used definition of SMEs as proposed by SME Policy (2007) of Small and Medium Enterprises Development Authority (SMEDA).

Variables Measurement

In order to ensure the reliability and validity of research study, variables used in study were measured by using items developed and used by earlier empirically tested research studies. Source of measurement of each construct is mentioned in Table No. 01 and are best source of measurement of each construct. Reliability and validity of constructs were tested through cronbach's alpha. Descriptive statistics were estimated to understand about general glimpse of data. Structural equation modeling was used to determine the determinants of innovation capability and to assess the mediating effect of knowledge sharing.

Results and Findings

Table No. 01: Cronbach's Alpha of All Constructs

S. No	Title of the Construct	Average inter item covariance	No. of items in scale	Scale reliability coefficient	Source of Measurement
1	Innovation Capability	0.07	27	0.87	(Calik, Calisir et al. 2017)

2	Technological Capability	0.26	4	0.79	(Zhou and Wu 2010)
3	Operational Capability	0.37	5	0.92	(Wu, Melnyk et al. 2010)
4	Managerial Capability	0.32	5	0.84	(Sirmon and Hitt 2009)
5	Transactional Capability	0.11	6	0.68	(Tello-Gamarra and Zawislak 2013)
6	Knowledge Sharing	0.08	9	0.66	(Cheng and Li 2001)

Generally acceptable rule for testing the reliability of construct is considered acceptable if it has calculated scale reliability co-efficient of 0.60 to 0.70 (Hulin, Netemeyer et al. 2001). If calculated co-efficient of reliability exceeds 0.80, then it is considered as good, whereas, if calculated value of co-efficient of reliability exceeds 0.95, then it might be an indicator of redundancies in data (Hulin, Netemeyer et al. 2001). Analysis of Table No. 01 shows that all the scales used for the measurement of variables are statistically reliable and internally consistent and they can be further used for the purpose of analysis in study. Descriptive statistics has been estimated for the purpose of getting basic information about variables included in study as well as to highlight the expected relationship among variables.

Table No. 02: Descriptive Statistics

S. No	Title of the Variable	Observations	Mean	Std. Dev.	Min	Max
1	Innovation Capability	91	3.85	0.27	3.11	4.48
2	Technological Capability	91	3.87	0.57	2.25	5.00
3	Operational Capability	91	3.47	0.63	2.20	5.00
4	Managerial Capability	91	3.62	0.62	2.20	5.00
5	Transactional Capability	91	2.91	0.29	1.83	3.50
6	Knowledge Sharing	91	3.90	0.35	3.22	4.77

Analysis of Table No. 02 reflects that innovation capability has 27% deviation on both sides from the mean of 3.85, whereas, technological capability has 57% deviation from its mean of 3.87, operational capability has 63% deviation from its mean of 3.47, managerial capability has 62% deviation from its mean of 3.62,

transactional capability has 29% deviation from its mean of 2.91 and knowledge sharing has 35% deviation from its mean of 3.90. Sensitivity in context of high level of deviation from means of all variables in an indication of diversity in SMEs as well as lack of conducive innovation friendly environment for SMEs. In order to establish the expected relationships between core variables and to seek the statistical significance of determinants of innovation capability, structural equation modeling (SEM) has been used.

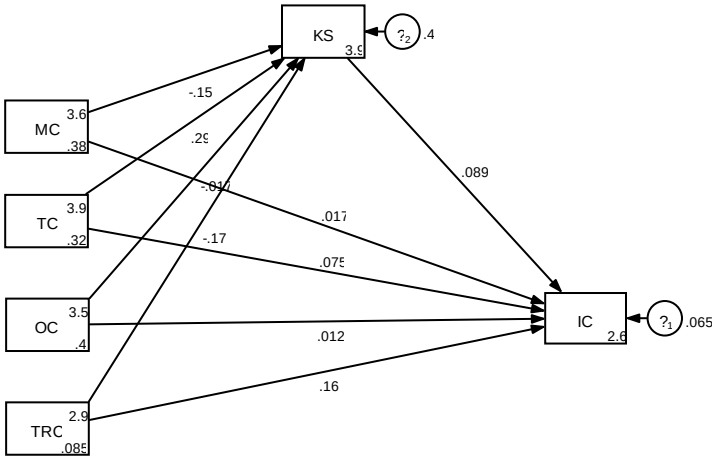


Table No. 03: Structural Equation Modeling (SEM)

Endogenous variables Observed: IC, KS Exogenous variables Observed: MC, TC, OC, TRC

Fitting target model: Iteration 0: log likelihood = -323.45418

Iteration 1: log likelihood = -323.45418

Number of obs = 91 Log likelihood = -323.45418

Coef.	OIM Std. Err.	Z	P>z	[95% Conf. Interval]

IC						
KS	0.089	0.042	2.120	0.034	0.006	0.172
MC	0.017	0.050	0.340	0.736	-0.082	0.116
TC	0.074	0.062	1.200	0.231	-0.047	0.197
OC	0.011	0.052	0.230	0.821	-0.091	0.115
TRC	0.163	0.096	1.690	0.090	-0.025	0.352
Constant	2.632	0.340	7.730	0.000	1.964	3.300
KS						
MC	-0.149	0.124	-1.200	0.231	-0.393	0.095
TC	0.287	0.152	1.890	0.059	-0.010	0.586
OC	-0.016	0.131	-0.130	0.899	-0.273	0.240
TRC	-0.165	0.238	-0.690	0.488	-0.632	0.302
Constant	3.864	0.742	5.210	0.000	2.409	5.319
var(e.IC)	0.064		0.009		0.048	0.086
var(e.KS)	0.399		0.059		0.298	0.534

LR test of model vs. saturated: chi2(0) = 0.000, Prob > chi2 =0.000

Analysis in Table 3 revealed that managerial capabilities, technological capabilities, operational capabilities and transactional capabilities are positively associated with innovation capabilities; however, their association is not statistically significant except for transactional capabilities, whereas, knowledge sharing is statistically positively associated with innovation capabilities. Mediating effect of technological capabilities is statistically positively associated with innovation capabilities. In context of the above analysis, technological capabilities, transactional capabilities and knowledge sharing are statistically significant determinants of innovation capability, whereas, managerial capabilities and operational capabilities are not statistically significant determinant of innovation capability.

In context of research questions of study under consideration, the analysis revealed;

- Technological capabilities and transactional capabilities are key determinants of innovation capability in context of SMEs of Pakistan.
- Knowledge sharing has significant mediating effect on technological capabilities and innovation capabilities in context of SMEs of Pakistan.
- Knowledge sharing has significant positive impact on innovation capabilities.

Study have partially supported and authenticated the findings of Guan and Ma (2003), Wang, Lo et al. (2008), Zawislak, Larentis et al. (2009), Yam,

Lo et al. (2011) and Zawislak, Cherubini Alves et al. (2012) pertaining to determiants of innovation capability. In context of findings pertaining to managerial capabilities as a significant determinant of innovation capability, study has negated the findings of Zawislak, Cherubini Alves et al. (2012). In context of findings pertaining to operational capabilities as a significant determinant of innovation capability, study has negated the findings of Liu (2020). In context of findings pertaining to technological capabilities as significant determinants of innovation capability, study has supported the findings of Urbinati, Chiaroni et al. (2020). In context of findings pertaining to technological capabilities as a significant determinants of innovation capability, study have supported the findings of Zawislak, Cherubini Alves et al. (2012), Hock-Doepgen, Clauss et al. (2020), Teixeira, Puffal et al. (2020) and Partanen, Kohtamäki et al. (2020). In context of findings pertaining to knowledge sharing, study has supported the findings of Hung, Kuo et al. (2013), Choi, Kim et al. (2016) and Choi, Chung et al. (2020) with reference to SMEs of Pakistan.

Conclusion

The basic aim of the study was to determine the key determinants of innovation capability and to dig out the possible mediating effect of knowledge sharing on innovation capability and its key determinants. The study used cronbach's alpha to test the structural stability of constructs and structural equation modeling to seek out the answers of key research questions by utilizing the primary data collected from ninety-one (91) manufacturing SMEs of Hattar Industrial Estate of Khyber Pakhtunkhwa, Pakistan. The study found that technological capabilities, transactional capabilities and knowledge sharing are statistically significant determinants of innovation capabilities of SMEs of Pakistan. Furthermore, knowledge sharing has significant mediating effect on technological capabilities and innovation capabilities in context of SMEs of Pakistan and knowledge sharing has significant positive impact on innovation capabilities. Besides academic contribution to the body of literature in context of key determinants of innovation capability in context of SMEs of Pakistan, study also suggested insights for policy makers and other key stakeholders. It suggests that Small and Medium Enterprises Development Authority (SMEDA) to focus on development of SME sector by initiating key interventions that enables them to develop the innovation capabilities by focusing on development of technological and intellectual infrastructure for SMEs in Pakistan. Financial institutions like commercial banks may consider these findings for designing financing products for SMEs of Pakistan.

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