DETERMINANTS AFFECTING SMES' SUSTAINABILITY IN PAKISTAN: THE ROLES OF FRUGAL INNOVATION AND RESOURCE MOBILIZATION

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TABLE OF CONTENTS

LIST OF TABLES

Page

LIST OF FIGURES

Page

LIST OF ABBREVIATIONS

SMEDA	Small and Medium Enterprise Development Authority
SME	Small and Medium Enterprise
FI	Frugal Innovation
DL	Design Leadership
KM	Knowledge Management
TMM	Top Management Mindfulness
OC	Organizational Collaboration
RM	Resource Mobilization
SUS	Sustainability
UN	United Nations
SDGS	Sustainable Development Goals
JICA	Japan International Cooperation Authority
AVE	Average Variance Extracted
CB-SEM	Covariance-based SEM
CMB	Common Method Bias
CMV	Common Method Variance
CR	Composite Reliability
HTMT	Heterotrait-Monotrait Ratio
OLS	Ordinary Least Squares
PLS-SEM	Partial Least Squares Structural Equation Modelling
SEM	Structural Equation Modelling
SPSS	Statistical Package for Social Sciences
VIF	Variance Inflation Factor

LIST OF APPENDICES

PENENTU YANG MEMPENGARUHI KELESTARIAN PKS DI PAKISTAN: PERANAN INOVASI FRUGAL DAN SUMBER MOBILASI

ABSTRAK

Telah ditubuhkan bahawa Perusahaan Kecil dan Sederhana (PKS) memainkan peranan penting dalam memupuk pembangunan ekonomi, penciptaan pekerjaan dan memacu pertumbuhan industri secara keseluruhan di negara membangun. Walau bagaimanapun, PKS pembuatan negara membangun mengalami kekangan sumber dan cabaran dalam menerima pakai amalan inovasi termaju dalam pasaran perniagaan yang pesat berubah. Oleh itu, PKS pembuatan ini bergantung kepada proses perniagaan konvensional, yang menimbulkan cabaran kemampanan melalui menyumbang dalam kadar kegagalan yang lebih tinggi tetapi juga membahayakan kesejahteraan masyarakat dan alam sekitar. Atas sebab ini, kajian semasa telah membangunkan rangka kerja teori dengan mengintegrasikan kepimpinan reka bentuk, pengurusan pengetahuan, kesedaran pengurusan atasan, kerjasama organisasi, penggemblengan sumber, inovasi berjimat, dan kemampanan PKS berdasarkan pandangan berasaskan sumber, teori eselon atas dan teori keupayaan dinamik. Model penyelidikan kajian ini dianalisis melalui pemodelan persamaan struktur segi empat terkecil separa (PLS-SEM) dengan sampel 388 pemilik dan pengurus PKS pembuatan di Pakistan. Dapatan kajian ini mendedahkan bahawa kepimpinan reka bentuk, pengurusan pengetahuan, kesedaran pengurusan atasan, dan kerjasama organisasi secara signifikan mempengaruhi inovasi berjimat cermat. Selain itu, kepimpinan reka bentuk, pengurusan pengetahuan, kesedaran pengurusan atasan dan kerjasama organisasi bertindak sebagai rangsangan untuk kemampanan PKS, dan inovasi berjimat menjadi pengantara proses ini. Selanjutnya, mobilisasi sumber secara signifikan

menyederhanakan hubungan kepimpinan reka bentuk dan kerjasama organisasi dengan kemampanan PKS. Penemuan kajian semasa memberikan pandangan yang berharga untuk pemilik dan pengurus PKS pembuatan di negara membangun seperti Pakistan dan membolehkan mereka mengoptimumkan penggunaan sumber dan mengatasi cabaran keberkesanan kemampanan. Dengan cara yang sama, penggubal dasar boleh mewujudkan platform yang memupuk kerjasama dalam kalangan PKS pembuatan yang memudahkan dalam mengurangkan kekangan sumber dan meningkatkan keupayaan inovasi.

DETERMINANTS AFFECTING SMES' SUSTAINABILITY IN PAKISTAN: THE ROLES OF FRUGAL INNOVATION AND RESOURCE MOBILIZATION

ABSTRACT

It is established that Small and Medium Enterprises (SMEs) play a significant role in fostering economic development, jobs creation and driving overall industrial growth in developing countries. However, manufacturing SMEs in developing countries experience resource constraints and challenges in the adoption of advanced innovation practices in the rapidly changing business markets. Thus, these manufacturing SMEs depend on conventional business processes, which poses sustainability challenges by contributing to the higher failure rate but also endangering the societal well-being and environment. For this reason, the current study has developed a theoretical framework by integrating design leadership, knowledge management, top management mindfulness, organizational collaboration, resource mobilization, frugal innovation, and SMEs' sustainability based on the resource-based view, upper echelon theory, and dynamic capability theory. The research model of this study was analyzed through Partial least square structural equation modeling (PLS-SEM) with a sample of 388 from the owners and managers of manufacturing SMEs in Pakistan. This study's findings revealed that design leadership, knowledge management, top management mindfulness, and organizational collaboration significantly influence frugal innovation. Additionally, design leadership, knowledge management, top management mindfulness, and organizational collaboration act as a stimulus for SMEs' sustainability, and frugal innovation mediates this process. Further, resource mobilization significantly moderates the relationship of design

leadership and organizational collaboration with SMEs' sustainability. The current study's findings provide valuable insights for the owners and managers of manufacturing SMEs in developing economies like Pakistan and enable them to optimize resource utilization and overcome the challenges of sustainability effectively. In the same manner, policymakers can establish platforms that foster collaboration among manufacturing SMEs which facilitates mitigating resource constraints and enhances innovation capabilities

CHAPTER 1

INTRODUCTION

1.1 Introduction of Chapter

In this chapter, the current study background is provided which explains the SMEs' overall importance and contribution in the global context. Further, this chapter establishes the social and economic contributions all over the world. SMEs in the developing economies context are also presented in detail. Subsequently, the problem statement of this study is presented along with research questions and objectives. Study significance and scope are also elaborated. Finally, the definition of this study constructs is given followed by the chapter's overall summary.

1.2 Background

1.2.1 Small and Medium-sized Enterprises (SMEs) Composition

Enterprise is defined as a business venture that provides products or services and ultimately leads the economic development (Savoiu, 2010). Similarly, enterprise refers to a for-profit business organization (Kokemuller, 2019). According to OECD (2019a), an enterprise is any legal entity that has the right to be involved in business functions to earn while following the rules and regulations of legal authorities. However, enterprises are differentiated based on their size. The well-known method of identifying enterprise depends on the number of workers formally employed (OECD, 2019a). More specifically, firms that have more than 250 employees are considered large firms (OECD, 2022). However, firms employing less than 251 employees come under small and medium enterprises (OECD, 2022). Further, SMEs are of three types generally i.e., firms with lower than 10 employees are considered as

micro-enterprises, 10-49 employees come under small and those firms employing 50-250 employees are considered as medium-sized enterprises (OECD, 2022; Rojas & Ruiz Garcia, 2020).

1.2.2 Contribution of Small and Medium-sized Enterprises (SMEs) of in Developed Economies

SMEs are dominantly contributing to the developed economies as compared to the large-scale firms. SMEs are dominant in job creation, household income, and economic development all over the world (Pauluzzo, 2021). Specifically, SMEs comprise 90% of businesses, contribute 50-60% of GDP (OECD, 2019b), and create 65% of total jobs in several developed countries (Zafar & Mustafa, 2017). It is found that 99.3% of the private businesses in the UK are SME-based which generates 47.8% of total jobs (Business, 2014) and 55% of GDP (Pulka, Ramli, & Mohamad, 2021). SMEs in Singapore and South Korea generate 49% and 50% of GDP, respectively, and 62% and 70% of employment creation respectively (Pulka et al., 2021). In the United States, 80% of firms are SME-based and make a major contribution to the national economy. In France, 99.9% of tourism businesses are based on SMEs (OECD, 2019b). Likewise, 99.8% of all the enterprises in Europe are SME based which creates 67% (two-thirds) of all the jobs (Commission, 2019; Južnik Rotar, Kontošić Pamić, & Bojnec, 2019). In China, 60% of the industrial growth is from SMEs (Huang, Boateng, & Newman, 2016). Japan is also among the leading nations, with SMEs accounting for 99% of the GDP. Therefore, SMEs are significantly contributing to the economic development of the developed economies.

1.2.3 Contribution of Small and Medium Enterprises (SMEs) in Emerging Economies

SMEs make a major contribution to the economy of developing countries as they provide 33% of national income and 45% of total employment (iQualify, 2015; Yoshino & Taghizadeh-Hesary, 2018). Another study noted that SMEs contribute 20-40% of total GDP in the low-income countries of Asia i.e., India and Pakistan (Rehman, 2016). However, 95% of businesses in the UAE are SME based and generate 43% of total jobs in the region (Polas, Tabash, Bhattacharjee, & Dávila, 2021). However, SMEs in Saudi Arabia, Oman, and Bahrain contribute 33%, 14%, and 28% of the total GDP respectively (Sawaean, Ali, & Alenezi, 2021). SMEs in Taiwan and South Africa contribute 38% and 57% of the GDP, whereas 70% and 61% in job creation respectively (Pulka, Ramli, & Mohamad, 2021). On the other hand, SMEs in Malaysia are dominant in business as they comprise 98% of all established businesses (Nor-Aishah et al., 2020) and contribute 38% of the total GDP (Hassan, Kamaluddin, Saad, & Samad, 2021) and 48% of total national employment (Ramdan et al., 2022). Likewise, SMEs comprise 99% of Indonesian businesses and contribute 61% of GDP and 87.8% to the national employment creation (BPS-Statistics, 2015). Keeping in mind the importance of SMEs to the economy and employment generation in developed and developing countries all over the world, governments across the world have turned their attention to SMEs in order to capitalize on their potential (Hossain, Akhter, & Sultana, 2022).

1.2.4 Pakistan's SME Sector

In Pakistan, SMEs play an important role in the overall economy and job creation. It is estimated that 5.3 million SMEs are operating in Pakistan (SMEDA,

2022). Further, more than 90% of the businesses fall under the SME category and generate 78% of total employment in the non-agricultural sector (Dost, Pahi, Magsi, & Umrani, 2019; SMEDA, 2016). Further, SMEs contribute 40% of the total GDP and 30% of total national exports (SMEDA, 2022).

Previously, several definitions of the SMEs have been provided by institutions i.e., the Federal Bureau of Statistics, State Bank of Pakistan and the provincial labor department, however, a single definition is still missing. Thus, in this study, the definition provided by SMEDA (Small Medium Enterprise Development Authority) in Table 1.1 has been followed and it is also recommended in Pakistan's SME Policy 2007 and SMEDA Research Report 2022.

Table 1.1 SME Definition

Category	**No. of Employees**	**Annual Turnover**
Small Enterprise (SE)	Up to 50	Up to PKR 150 Million
Medium Enterprise (ME)	51-250	Above PKR 150 Million to PKR 800 Million

Further, SMEs exist in all four provinces of Pakistan. The majority of the SMEs are established in Punjab with 61% of total SMEs, Sindh 18%, Baluchistan 7%, Khyber Pakhtunkhwa 13.2%, and Islamabad (Capital) 0.8% (SMEDA, 2022). The following Table 1.2 illustrates the distribution of SMEs according to the provinces of Pakistan.

Table 1.2 SMEs division in Provinces of Pakistan

Sr. No.	**Provinces**	**SMEs Share**
1	Punjab	61%
2	Sindh	18%
3	Khyber Pakhtunkhwa	7%
4	Baluchistan	13.2%
5	Islamabad (Capital)	0.8%

Source: Census of Manufacturing Industries (CMI) and Pakistan Bureau of Statistics (PBS), 2015

In the following Table 1.3, number of the manufacturing SMEs specifically all over Pakistan is given.

Table 1.3 Total manufacturing SMEs division by Provinces of Pakistan

Sr. No.	Province	No. of SMEs	Percentage
1	Islamabad	2314	0.4
2	Punjab	399,152	68.4
3	Sindh	80,804	13.9
4	Total	482,270	82.7
5	Other Regions	100,903	17.3
	Total Pakistan	583,173	100

Source: Japan International Cooperation Agency (JICA), 2018.

SMEs in Pakistan belong to several sectors where 78.5% of the total industry comprises wholesale, retail, trade, and services. Further, 20% belong to the mining, power, water and gas supply, construction, and manufacturing. The remaining 1.5% of the SMEs belong to agriculture, forestry, hunting, and fishery. This division of SMEs according to the sector is given in the following Table 1.4.

Table 1.4 SME distribution by Economic Sector

Sr. No.	Province	No. of SMEs	Percentage
1	Agriculture, forestry, hunting and fishing	46,378	1.6%
2	Mining and quarrying	713	0.02%
3	Manufacturing	583,329	19.7%
4	Electricity, gas and water	124	0.004%
5	Construction	1,410	0.0%
6	Wholesale and retail trade and restaurants and hotels	1,566,722	53.0%

7	Transport, storage and communication	51,564	1.7%
8	Financing, insurance, real estate and business services	48,440	1.6%
9	Community, social and personal services	659,641	22.3%

Source: Japan International Cooperation Agency (JICA), 2018.

However, SMEs' contribution to employment has increased in the last five years but the overall contribution of the manufacturing SMEs in the employment of the manufacturing sector has declined (SMEDA, 2022). It is also emphasized that even SMEs in Pakistan are majorly generating employment but their contribution to economic development is not sufficient to boost overall growth (Bakhshi, Agrawal, Mendon, Birau, & Bărbăcioru, 2023). According to 2020-21, the manufacturing sector's proportion in the employing the labor force was 15.30% in 2015-16 and 14.90% in 2020-21. The overall number of employees in the manufacturing SMEs was 4.52 million for the fiscal year 2015-16, and predicted 5.10 million for the fiscal year 2020-21. The following Table 1.5 reveals the overall contribution of manufacturing SMEs to employment.

Table 1.5 Total share of Manufacturing SMEs in employment

Sr. No.	Description	2015-2016	2020-2021
1	Manufacturing sector share in employment	15.30%	14.90%
2	SMEs share in employment	4,515,940	5,110,328
3	Manufacturing SMEs share in Pakistan’s manufacturing sector employment	90.38%	90.27%

Source: SMEDA 2022

1.2.5 Challenges to the Manufacturing SMEs in Pakistan

SMEs' contribution to the economies without the distinction of a developed or developing economy is recognized, however, they are exposed to several challenges of sustainability due to the limitation of the resources and technical expertise (Iqbal, Ahmad, Li, & Li, 2022; Kiranantawat & Ahmad, 2022). Especially, manufacturing SMEs cannot sustain their economic contribution due to a higher failure rate in their initial years of business (Lin, Song, Sharma, & Lee, 2020; Mason, 2020; Sharma, Govindan, Lai, Chen, & Kumar, 2021; Sproul, Cox, & Ross, 2019). SMEs are more vulnerable to uncertainties and crises as compared to large-scale firms (Verreynne, Ford, & Steen, 2023). It is noted that 60-80% of new businesses fail to survive after five years of establishment (Sproul et al., 2019). Thus, a significant number of SMEs around the globe cannot sustain their businesses in the longer run and their economic contribution is inconsistent in several economies (Nikolić, Jovanović, Nikolić, Mihajlović, & Schulte, 2019). In Pakistan, firms are experiencing a higher cost of production due to an energy crisis which causes failure to generate the targeted revenue (Asghar et al., 2023).

Furthermore, manufacturing SMEs rely on conventional innovation processes that pose a significant threat to the employees and society (Radicic, Pugh, & Douglas, 2020). For instance, due to a lack of expertise and innovation capabilities, manufacturing SMEs in Pakistan consume excessive water resources and non-renewable energy which endangers society and the environment (Sarfraz, Naseem, & Mohsin, 2022; Tehseen, Ghaffar, Mahmood, Younus, & Anam, 2024). Additionally, SMEs' manufacturing operations pose a threat to community health and worker safety (Horváthová, Mokrá, & Konečný, 2023). The study also noted that operations and working conditions of manufacturing firms especially small and medium-sized firms

jeopardize worker safety and community health (Chetty, Boojhawon, Bhagwant, & Levy, 2024; Van Nguyen, Phan, & Ha, 2024).

Besides the economic and societal challenges, manufacturing SMEs are positively contributing to environmental hazards (Rodríguez-Espíndola et al., 2022). The study found that the quantity (KG/ US$1000 GDP) of raw materials utilized by the SMEs of Asia is twice that of the developed economies that influence climate change (Kiranantawat & Ahmad, 2022). Additionally, massive resource utilization and wastage ultimately lead the resource scarcity (Lopes de Sousa Jabbour, Vazquez-Brust, Chiappetta Jabbour, & Andriani Ribeiro, 2020). Further, due to the ignorance towards the measures of sustainable practices and control over industrial wastage, major urban cities of Pakistan i.e., Lahore, Karachi, Peshawar, and Rawalpindi have been included in the 20 most polluted cities of the world (Bilal et al., 2021). All of the abovementioned challenges and the recent rising issue of smog in the urban cities of Punjab have forced the government of Pakistan to implement restrictions on the production processes in order to protect the environment (Raza et al., 2021).

Therefore, SMEs' failure to survive, compromising societal wellbeing and enormous damage to the climate exacerbates sustainability i.e., economic, social, and environmental. Considering the emerging issues of sustainability all over the world, sustainable goals provided by the United Nations have gained more familiarity (Iqbal, Ahmad, Li, & Li, 2021; Smith, Discetti, Bellucci, & Acuti, 2022; Ullah, Ahmad, Rehman, & Fawad, 2021). Sustainability consists of three key elements i.e., economic, social, and environmental (Dima et al., 2022; Frobisher, 2021).

However, the ignorance of manufacturing SMEs towards the rising economic, social and environmental challenges can risk their longer-run survival (Durrani, Raziq,

Mahmood, & Khan, 2024). In Pakistan, manufacturing SMEs significantly contribute to the national GDP and employment generation and their inability to achieve sustainability may further impair their productivity, operating costs, and capacity to compete in global markets (Arshad, Sulaiman, & Yusr, 2024; Naz, Khan, Bhatti, & Malik, 2024). Likewise, unsustainable manufacturing SMEs in emerging nations like Pakistan can increase unemployment and unsteady income growth due to closing their businesses (Hameed & Siddiqui, 2024). Additionally, unsustainable manufacturing processes are also being discouraged in the global markets, and if manufacturing SMEs retain these business practices may find difficulty in exploiting the export opportunities (Debnath et al., 2024). Importantly, using traditional processes reduces productivity, uses a lot of raw material and generates massive waste which can make Pakistani manufacturing SMEs more financially vulnerable and compromise workers' safety, societal well-being and environmental responsibility (Yaqoob et al., 2021). Similarly, socially unsustainable manufacturing SMEs can endanger the safety of their workers by providing subpar working conditions, and they cause health risks by producing excessive waste (Rauf et al., 2022). Besides this, Pakistan is already experiencing several environmental hazards i.e., floods, poor climate, rising smog and rapidly increasing AQI due to industrial wastage, excessive utilization of water, outdated technology and untreated emissions (Goheer et al., 2024). As a result, unsustainable manufacturing SMEs may increase the incidences of climate change, pollution, and depletion of natural resources. Consequently, International and national regulatory bodies may also impose restrictions on these businesses.

In order to achieve manufacturing SMEs' sustainability, the literature has identified several internal and external factors i.e., leadership styles, organizational learning, R&D, stakeholder engagement, etc. (Akbari, Bagheri, Imani, & Asadnezhad, 2020;

Chandra, Paul, & Chavan, 2020; Liu, 2024; Roberts & Muralidharan, 2022). However, manufacturing SMEs are of small size and face resource scarcity especially in emerging markets which influences their innovation and poses difficulty in achieving sustainability (Martínez-Román, Gamero, de Loreto Delgado-González, & Tamayo, 2019). These limitations confine the manufacturing SMEs to the traditional innovation processes and technologies that hamper sustainability. Further, customers from emerging markets demand cheaper and more valuable products at a reasonable price which can be served through frugal innovation (Pisoni, Michelini, & Martignoni, 2018). Frugal innovation can help manufacturing SMEs to address the needs of clients at the bottom of the pyramid with limited resources (Pansera & Sarkar, 2016). Frugal innovation entails such an innovation process that provides cost-effective and affordable value products to resource-constrained customers (Zeschky, Widenmayer, & Gassmann, 2011b). Hence, frugal innovation enables SMEs of developing economies to successfully serve customers by conserving resources and meeting sustainability challenges while avoiding damage to the society and environment (Ananthram & Chan, 2021; Sarkar & Mateus, 2022).

On the other hand, the adoption of frugal innovation is a complex process as it necessitates the transformation of business processes to compete in business marketplaces (López-Sánchez & Santos-Vijande, 2022; Sacanamboy-Trujillo & Escandón-Barbosa, 2025). The study also mentioned that SMEs fall behind in terms of understanding innovation (Al Koliby, Abdullah, & Suki, 2022). The possible reason attached with the failure to adopt the appropriate innovation process is the absence of competency among entrepreneurs (Nasir, Al Mamun, & Breen, 2017; Yoshino, Taghizadeh-Hesary, Charoensivakorn, & Niraula, 2016). The entrepreneurs' competency can be described as their traits, skills, intentions, and unique

characteristics (Bird, 1995). Hence, design leadership can enable manufacturing SMEs with competency to foresee future innovative requirements and undertake innovative design in the manufacturing process (Muenjohn & McMurray, 2017). The leadership that focuses on the design functioning facilitates in adopting the appropriate firm's innovation process (Horth & Buchner, 2014). Therefore, design leadership emerges as an appropriate leadership in order to foster frugal innovation among manufacturing SMEs (Iqbal, Ahmad, & Li, 2021a; Muenjohn & McMurray, 2017; Waqas, Halim, & Ahmad, 2022). Additionally, design leadership supports sustainable innovative solutions that facilitate in achieving sustainability (Iqbal, Ahmad, et al., 2021a; Ye, Liu, & Tan, 2022).

Besides this, learning new skills and innovation processes depends on creativity and knowledge which is possible through the firm's knowledge management (Mardani, Nikoosokhan, Moradi, & Doustar, 2018). Knowledge management provides updated information that helps in solving problems (Sapta, Sudja, Landra, & Rustiarini, 2021; Velásquez & Lara, 2021). Thus, knowledge management influences learning and expertise which drives frugal innovation (Abbas & Kumari, 2021; Brahami & Matta, 2018; Kun, 2022). Zhao, Liu, Andersson, and Shenkar (2022) have also found that firm's know-how has significant association with frugal innovation.

Furthermore, the adoption of the innovation relies on the socio-cognitive ability of the leadership (Ertl, Setzke, Böhm, & Krcmar, 2020). The socio-cognitive abilities of the leadership enable the firm with dynamic capabilities (Brown and Ryan, 2003). Specifically, a socio-cognitive perspective of leadership i.e., mindfulness enables greater flexibility and sensitivity to respond to the changes through characteristics of attention and awareness (Levinthal & Rerup, 2006). Mindfulness comprises the

characteristics of attention to the evidence of the firm's failure, which is important in adopting innovation (Oeij, Hulsegge, & Preenen, 2022). More importantly, a leader's mindfulness improves the firm's efficiency in planning, managing, and adopting better technology and innovation processes (Butler & Gray, 2006).

On the other hand, a firm's innovation process requires transformation and improvisation which depends on the resources and latest skills, and any single firm especially SMEs cannot make it possible on its own (Peronard & Brix, 2018). Thus, manufacturing SMEs should collaborate with other firms in order to enhance their skills and innovation for the achievement of the desired goals (Maziriri & Maramura, 2022; Zhang, Lettice, & Pawar, 2019). The study noted that firms with better collaborative relationships are more capable of adopting the innovation processes (Najafi-Tavani, Najafi-Tavani, Naudé, Oghazi, & Zeynaloo, 2018). In a similar vein, collaboration among the firms significantly influences the success of frugal innovation (Dandonoli, 2013; Rosca, Arnold, & Bendul, 2017).

More importantly, firms cannot translate knowledge and collaboration, leadership characteristics, into the required innovation process as it requires dynamic capability (Chowdhury & Quaddus, 2017). Further, the rapidly changing requirements of the customers require necessary and sophisticated resources to bring value to the products (Reypens, Bacq, & Milanov, 2021). However, SMEs face resource scarcity which creates hurdles in the way of adopting the appropriate innovation process (Atiase, Kolade, & Liedong, 2020; Reypens et al., 2021). The firm's ability to seek resources and its strategic utilization in the firm's process can provide unique solutions to the problems (Agarwal, Chakrabarti, Prabhu, & Brem, 2020). Hence, resource mobilization enables firms with dynamic capability as it entails the utilization of a

firm's resources in unique ways and also helps in accessing the resources from the environment (An, Rüling, Zheng, & Zhang, 2020; Nason & Wiklund, 2018; Stenholm & Renko, 2016; Wu, Liu, & Zhang, 2017). Therefore, resource mobilization can act as a dynamic capability to translate leadership characteristics, firm's knowledge and collaboration into the desired frugal innovation process among the manufacturing SMEs.

Considering the sustainability requirements and opportunities, this study aimed to investigate how manufacturing SMEs can capitalize on design leadership, knowledge management, top management mindfulness, and organizational collaboration toward sustainability through the mediating role of frugal innovation. Further, this study analyzes the strengthening role of resource mobilization between the relationship of design leadership, knowledge management, top management mindfulness, organizational collaboration and frugal innovation.

1.3 Problem Statement

Manufacturing SMEs play a critical role in the economic development of Pakistan. However, the rapidly changing technology and market requirements enhance the uncertainties and pose sustainability challenges in economic, social and environmental spheres (Smith et al., 2022). Precisely, more than 50% of the manufacturing SMEs in Pakistan lose their ability to continue business in their initial years of functioning and the remaining two-thirds barely survive the next five years (Aftab, Naveed, & Hanif, 2021; Burhan, Salam, Abou Hamdan, & Tariq, 2021). The possible reasons attached to their failure are i.e., only 15-20 % of the SMEs have access to the formal credit (Burhan et al., 2021). Further, 155% increase in energy cost (Chughtai, Uqaili, Mirjat, & Shaikh, 2023; Kasi, Raziq, & Khan, 2019; SBP, 2020)

and comparatively twice the quantity of raw material utilization than their counterparts (Chughtai et al., 2023; Kasi et al., 2019; SBP, 2020) made it more difficult for them to control operating expenses and reduces their ability to compete in global markets. So, barely 5 percent of Pakistan's manufacturing SMEs are involved in exporting activities (SMEDA, 2022).

Furthermore, Pakistani SMEs lack the resources and over 80% do not allocate any portion of their budget towards innovative technologies (CCP, 2023). Consequently, a lack of innovation due to financial constraints restricts them from utilizing conventional operational processes that hinder their capacity to ensure employees' safety and well-being of the society (Iqbal, Ahmad, & Halim, 2021). The survey also showed that over 70% of manufacturing SMEs had unsafe working conditions that jeopardized employees' safety (Javed, 2021; PILER, 2016).

In addition to the social and economic problems, Pakistani manufacturing SMEs are also dealing with environmental challenges. According to PEPA (2021), just 10% of Pakistan's manufacturing SMEs have implemented appropriate waste management practices, and over 50% are struggling to adhere to environmental policies. Furthermore, 5% of SMEs use renewable energy, and 10% of SMEs use energy-efficient techniques (ADB, 2022). All of this adds to the environmental risks, and as a result, Pakistan's air quality index (AQI) is steadily declining. In particular, Lahore has an AQI of 250-1000, making it one of the world's most polluted cities (Fatima, Ahmad, Butt, Arshad, & Kiani, 2024). Further, Pakistan is also one of the top 10 nations affected by climate change, and in 2022, a flood cost the country $30 billion (World-Bank, 2022).

Regarding sustainability i.e., economic, social and environmental challenges, manufacturing SMEs strive for its key drivers given the resource-constraint environment in the emerging market and the price-sensitivity of the customers (Cai et al., 2019; Levänen, Hossain, & Wierenga, 2022; Martin et al., 2019). However, innovation capabilities among the manufacturing firms lead to sustainability (Abbasi, Hussain, Haddad, Salman, & Ozturk, 2022) and only 5% of the manufacturing SMEs in Pakistan focus on the R&D initiatives that impede innovation adoption (CCP, 2023). Precisely, frugal innovation is more appropriate in order to provide a cost-effective solution to the resource-constraint environment of customers from emerging markets (Zeschky, Widenmayer, & Gassmann, 2011a)(Hossain, Agarwal, Bhatti, & Levänen, 2022). However, findings on the role of frugal innovation towards manufacturing SMEs' sustainability are inconclusive among the developing economies i.e., Pakistan (Hossain, Park, & Shahid, 2023; Iqbal et al., 2022).

Moreover, investigations on the attainment of frugal innovation emphasized that the leader's competency plays a critical role in the context of manufacturing SMEs (Iqbal, Ahmad, & Halim, 2021). Therefore, design leadership entails the competency in considering the future innovation requirements and design in the manufacturing processes (Muenjohn & McMurray, 2017) that make it suitable for the adoption of frugal innovation. It is also noted that leadership that can effectively manage design functions generate strategic innovative solutions (Bucolo, Wrigley, & Matthews, 2012; Muenjohn et al., 2021). Previously, findings have investigated different leadership styles towards frugal innovation i.e. sustainable leadership, entrepreneurial leadership (Iqbal, Ahmad, Li, et al., 2021), and transformational leadership (Le, 2021; Lei, Gui, & Le, 2021) and still the understanding regarding the antecedents of frugal innovation is unclear.

Besides this, frugal innovation relies on the learning and skills of the firms which necessitate knowledge management (Bertello, De Bernardi, Santoro, & Quaglia, 2022; Mardani et al., 2018). Knowledge management seeks the latest information which significantly influences problem-solving ability and ultimately leads to frugal innovation (Kun, 2022; Sapta et al., 2021). However, literature on the empirical investigation regarding how knowledge management can translate into frugal innovation and achieve manufacturing SMEs' sustainability in the emerging economy is scant. Moreover, a firm's adaptation and improvisation of the innovation processes rely on its leader's socio-cognitive skills (Levinthal & Rerup, 2006; Oeij et al., 2022). For instance, leadership mindfulness exhibits the ability to be vigilant and cognizant of the movements that facilitate responding to the changes in the market and influence innovation adoption (Althammer, Reis, van der Beek, Beck, & Michel, 2021; Daniel, Gentina, & Kaur, 2023). Further, a leader's mindfulness fosters the awareness and right decision-making that supports the firm's innovation process (Butler & Gray, 2006). Previously, Bhatti, Santoro, Khan, and Rizzato (2021) investigated the relationship of top management mindfulness toward business model innovation and supported the notion of inconsistent findings in the literature.

Besides this, business marketplaces are rapidly changing which makes it difficult for manufacturing SMEs to adopt frugal innovation on their own in a short time under limited resources. Hence, collaboration can help to access the required resources and update their skills to overcome innovation challenges. Maziriri and Maramura (2022) have also stressed the need for manufacturing SMEs' collaboration with others to take benefit of the mutual skills that significantly determine better-quality products and services. Further, findings on the collaboration and its role towards frugal innovation

among manufacturing SMEs of the developing economies are still evolving (Hossain et al., 2023).

Previously, literature has presented several mediators between the relationship of leadership characteristics and organizational resources with SMEs' Sustainability i.e., business model innovation, green innovation, agility, strategic change, stakeholder engagement, consumer social responsibility etc. (Aboelmaged & Hashem, 2019; Alshukri, Seun Ojekemi, Öz, & Alzubi, 2024; Taghizadeh, Rahman, Nikbin, Radomska, & Maleki Far, 2024; Zhang & Ma, 2021). All of these constructs support SMEs in optimizing internal organizational capabilities, however, frugal innovation offers cost-effective and more sustainable solutions to these SMEs in order to survive in the longer run (Berndt et al., 2023). Therefore, the ability to meet the requirements of cost-effectiveness under the resource constraint environment makes frugal innovation a more competitive strategy for the achievement of manufacturing SMEs' sustainability goals Perera & Badir, 2025).

Furthermore, leadership characteristics, resources, information and skills are necessary to achieve sustainability, however, their transformation depends on the dynamic capabilities. The study emphasized that a firm's existence in this modern and fast-changing period is determined by how well it uses its current and advanced resources to provide value to its consumers (Atiase et al., 2020; Reypens et al., 2021). However, manufacturing SMEs of emerging markets like Pakistan lack the necessary resources which can addressed through resource mobilization (Hossain, 2022; Karami, Hossain, Ojala, & Mehrara, 2024). For instance, resource mobilization supports utilizing the unique combination of the existing resources and also seeks the necessary resources from the environment that are crucial to bringing unique solutions to the problems (An

et al., 2020; Nason & Wiklund, 2018; Stenholm & Renko, 2016; Wu et al., 2017). Thus, resource mobilization offers potential benefits in order to exploit the leadership characteristics and organizational resources towards frugal innovation among manufacturing SMEs.

Contrarily, the literature investigated several moderating factors in order to achieve the desired innovation process. Specifically, these moderating factors include management support, psychological competitiveness, government support, etc. (Karami et al., 2024). All of these aforementioned factors focus on assistance from the internal and external environment. Likewise, the study considered the role of bricolage in fostering frugal innovation (Iqbal, Ahmad, & Halim, 2021; Santos, Borini, de Miranda Oliveira, Rossetto, & Bernardes, 2020). Bricolage prioritizes resource conservation, but it sacrifices quality to satisfy certain customer needs (Hossain, 2022; Reypens et al., 2021). However, resource mobilization which strategically utilizes its resources and seeks new ones can provide useful innovative outcomes (Hossain, 2022). Previous investigations regarding how resource mobilization can play a role in achieving frugal innovation in emerging markets are scant (Hossain, 2022; Hossain et al., 2021).

Subsequently, from a theoretical standpoint, investigating the influence of the above-mentioned constructs on manufacturing SMEs' sustainability can offer deep insight regarding the integration of RBV theory, upper echelon theory and dynamic capability theory. Following the RBV theory, this study indicates that a firm's knowledge and collaboration act as essential resources that enable it to accomplish the manufacturing SMEs' sustainability. The knowledge provides the learning and skills that facilitate a potential resource to exploit sustainability (Abbas & Sağsan, 2019). Likewise,

organizational collaboration promotes these manufacturing SMEs through collaborative learning and essential resources during times of scarcity and eventually affects sustainability (Aggarwal & Wu, 2018). However, utilizing the UET theory, this study presents design leadership and mindfulness as the key leadership characteristics that facilitate foreseeing future innovative requirements and staying aware of the changes in the market respectively. Therefore, both leadership characteristics of design leadership and mindfulness play essential roles in order to adopt frugal innovation. Furthermore, considering the dynamic capability theory the current study presents resource mobilization as a moderator that can strengthen the relationship of leadership characteristics (design leadership and top management mindfulness) and resources (knowledge management and organizational collaboration).

1.4 Research Objectives

Based on the aforementioned discussion regarding SMEs of Pakistan to ensure their sustainability in the emerging challenges of climate change, environmental hazards, and poverty, this study aims to achieve the following objectives:

1. To investigate the influence of design leadership on frugal innovation.
2. To investigate the influence of knowledge management on frugal innovation.
3. To investigate the influence of top management mindfulness on frugal innovation.
4. To investigate the influence of organizational collaboration on frugal innovation.
5. To investigate the influence of frugal innovation on SMEs' sustainability.
6. To analyze the mediating role of frugal innovation between the relationship of design leadership and SMEs' sustainability.
7. To analyze the mediating role of frugal innovation between the relationship of knowledge management and SMEs' sustainability.

8. To analyze the mediating role of frugal innovation between the relationship of top management mindfulness and SMEs' sustainability.
9. To analyze the mediating role of frugal innovation between the relationship of organizational collaboration and SMEs' sustainability.
10. To examine the moderating role of resource mobilization on the relationship of design leadership, knowledge management, top management mindfulness and organizational collaboration with frugal innovation.

1.5 Research Questions

Regarding the objectives given, the following research questions have been addressed:

1. Is there a significant relationship between design leadership and frugal innovation?
2. Is there a significant relationship between knowledge management and frugal innovation?
3. Is there a significant relationship between mindfulness and frugal innovation?
4. Is there a significant relationship between organizational collaboration and frugal innovation?
5. Is there a significant relationship between frugal innovation and SMEs' sustainability?
6. Does frugal innovation mediate the relationship between design leadership and SMEs' sustainability?
7. Does frugal innovation mediate the relationship between knowledge management and SMEs' sustainability?
8. Does frugal innovation mediate the relationship between top management mindfulness and SMEs' sustainability?
9. Does frugal innovation mediate the relationship between organizational collaboration and SMEs' sustainability?

10. Is resource mobilization strengthening the relationship of design leadership, knowledge management, top management mindfulness and organizational collaboration with frugal innovation?

1.6 Scope of the Study

The current study has employed a cross-sectional and empirical investigation of the relationship among design leadership, knowledge management, top management mindfulness, organizational collaboration, frugal innovation, and manufacturing SMEs' sustainability in Pakistan. This study also examined the moderating role of resource mobilization between the relationship of design leadership, knowledge management, top management mindfulness, and organizational collaboration with frugal innovation. Specifically, this study focuses on frugal innovation as the determinant of SMEs' sustainability. Therefore, this study's purpose makes the manufacturing SMEs from the following sectors more appropriate for data gathering i.e., automobile parts, cookware products, electronic accessories and tools, home appliances, leather products, mechanical machines and tools, sports goods and fitness products, surgical instruments, textile fabric and products.

On the other hand, this study focuses on information gathering regarding organizational resources, leadership characteristics, and important decisions of frugal innovation adoption to achieve manufacturing SMEs' sustainability. Based on this study's purpose, information was gathered at the organizational level, which made it logical to include the owners and managers of these manufacturing SMEs in order to get the necessary data. The key decisions of these manufacturing SMEs are governed by the owners and general managers (Crovini, Santoro, & Ossola, 2021; Nazir & Khan, 2024). Further, general managers directly control the functional areas of these small

firms. Thus, this study's unit of analysis was the organizational level which was represented by only the owners and managers of the manufacturing SMEs located in four cities of Punjab i.e., Lahore, Gujranwala, Sialkot, and Faisalabad. The reason behind targeting these four cities is being the hub of all manufacturing industries of the Punjab province (Haroon, 2019; SMEDA, 2016; Tabassum, Nazeer, Zehra, & Abdullah, 2022). The Map of Pakistan is also displayed in the following figure 1.1.

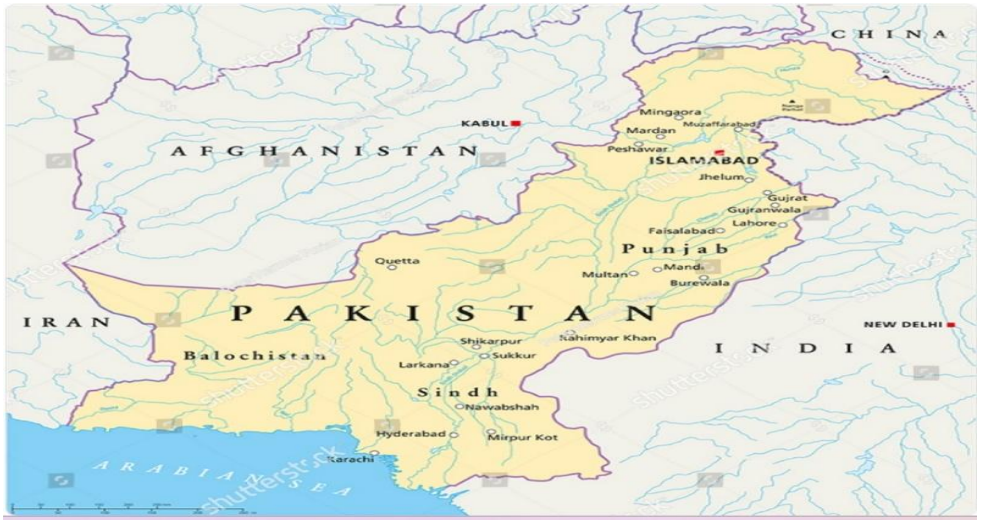

Figure 1.1 Map of Pakistan

1.7 Significance of Study

This study enhances the body of knowledge regarding design leadership, knowledge management, top management mindfulness, organizational collaboration, resource mobilization and frugal innovation of the manufacturing SMEs of Pakistan to reveal the practical implications in the context of Sustainability challenges. This study theoretically contributes by confirming and extending the theories that are undertaken in this study named Resource-based theory (RBV), Upper Echelon theory (UET), and Dynamic capability theory (DCT). This study also provides the significance of design leadership, knowledge management, top management mindfulness and organizational collaboration to achieve manufacturing SMEs' sustainability through limited available empirical evidence regarding these constructs in the context of Pakistan. Further, this

study attempts to offer important practical contributions to the policymakers and professionals who are interested in making useful strategies to achieve manufacturing SMEs' sustainability.

1.7.1 Theoretical Contributions

This study has contributed to the following areas. First, this study fills the gap in the domain of design leadership literature. This study also contributes to the literature by investigating the manufacturing SMEs while considering design leadership, knowledge management, top management mindfulness, organizational collaboration, resource mobilization, and frugal innovation to resolve the emerging challenges of SMEs' sustainability in the context of developing countries i.e., Pakistan. Further, this study enhances the traditional resource-based view theory and upper echelon theory and dynamic capability theory to transform the firm's leadership characteristics and resources into the desired frugal innovation process. Specifically, the Resource-based view theory explains the importance of the resources to achieve a competitive advantage and the firm's required outcomes (Barney, 1991). Further, this study applies the Upper Echelon theory which upholds the leadership characteristics to achieve the firm's desired objectives of frugal innovation and SMEs' sustainability. In addition, following the dynamic capability theory, this study contributes to the body of literature on how resource mobilization can aid in the strategic allocation and utilization of resources and play a crucial role in transforming leadership characteristics into a frugal innovation process.

Therefore, this study adds to the literature through presenting empirical evidence on the combination of leadership characteristics (design leadership and top management mindfulness) and organizational resources (knowledge management and

organizational collaboration) as the unique factors that can facilitate yielding frugal innovation and sustainability among manufacturing SMEs. Additionally, this study contributes to the literature by providing empirical evidence regarding the dynamic capability of resource mobilization to integrate manufacturing SME leaders' characteristics and resources with frugal innovation in order to successfully achieve sustainability.

Furthermore, this study contributes towards a better understanding of the dynamic capability theory in the context of manufacturing SMEs to overcome the resources, innovation and sustainability challenges as recent investigations call for the further application and validation of dynamic capability theory in diverse sectors (Arranz, Arroyabe, Li, & Fernandez de Arroyabe, 2020).

1.7.2 Practical Significance

From the practical perspective, this study's findings provide useful and evidence-based suggestions to the policymakers and government institutions of Pakistan (i.e., SMEDA). Specifically, firms in emerging markets are facing the challenges of economic, social and environmental along with specific customers' requirements over time that influence manufacturing SMEs and failure to meet these challenges influences their survival (Hossain, 2022; Imran, Salisu, Aslam, Iqbal, & Hameed, 2019; Iqbal, Ahmad, & Halim, 2021). Therefore, this study's findings can facilitate in achieving the manufacturing SMEs' sustainability while fulfilling the demands of emerging market customers through frugal innovation. Frugal innovation not only overcomes the resource constraints of manufacturing SMEs but also helps in preventing the society and environment (Hossain, Levänen, & Wierenga, 2021).

Following this study's recommendations, manufacturing SMEs can use knowledge