The Determinants of Innovation Challenges in SMEs: A Systematic Review

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ABSTRACT:
While small and medium-sized enterprises (SMEs) are recognized as key drivers for job creation and competitive industry revitalization, SMEs' innovation activities are affected by a frictious and enduring mix of internal and external barriers of latent resources. This systematic review summarizes publication from 2015 to 2025 and aims to identify the key factors of innovation challenges in SMEs, providing a conceptual model of financial, technological, human resources and managerial, market, regulatory and policy barriers, innovation capability, innovation challenges, and industry type. Within the framework of PRISMA 2020, 45 studies were reviewed, and evidence was structured using a binary literature review matrix. The synthesis demonstrated that challenges SMEs face in innovation are due to combinations of resource limitations. Specifically, from the synthesis, limited resources can lead to a lack of financial resources to support trial and error processes, leading to weak technological capabilities and subsequently leading to less processing and structural innovation, weak human resources leading to less managerial and organizational innovation, limited financial resources, and marginal market innovation, and more regulatory compliance barriers. SMEs experience uneven innovation challenges based on the combinations of the challenges mentioned herein. Innovation capability shapes the intensity of these challenges, and the industry type influences the correlation between innovation challenges and innovation capability.

Keywords: SMEs, Innovation Challenges, Innovation Capability, Financial Constraints, Technological Capabilities.

1. Introduction

Small and medium-sized enterprises (SMEs) are fundamental to many countries and economies because they provide employment and facilitate industrial growth. They are important to new and emerging industrial development such as technological innovation as they are flexible and able to operate efficiently in rapidly changing markets. On the other hand, the features that allow SMEs to maintain their competitiveness can present significant challenges to their

innovation especially in segments such as the technology and finance industry. In terms of SMEs, innovation challenges pose restrictions to creating and developing new technological advances and implementing new strategies to improve and streamline business functions. These challenges can arise due to inadequate research and development funding, poor technological adoption, ineffective collaboration, lack of skills, poor management, lack of documentation, and poor engagement and alignment. Love and Roper (2015) indicated that SME operational capabilities and external business environment are markedly important to innovation; this echoes Saunila (2020) asserted that innovation capability is tied to the business environment and systems on the business strategy continuum. Engineering Management literature is also in agreement that SMEs face challenges in developing innovative business practices. These challenges emanate from poor employee competence and inadequate alignment of research priorities to SMEs goals.

Financial barriers continue to exist for SMEs as there is a reliance on internal funding, bank loans, or informal funding. Limited access to finances affects innovation, technology use and the scope of innovation ideas, especially in times of economic crisis. It is important to consider the role of technology as innovation that is occurring today is reliant on digital systems, production systems, and technology-based collaboration. SMEs that lack the resources to adopt, integrate and maintain relevant technology may lack the ability to bring ideas to fruition. Additionally, human capital is required for innovation as owners, managers, and employees alike need to recognize external knowledge, interpret technical knowledge, resolve functional issues, and communicate ideas across functional departments. Low skilled human capital can exacerbate other barriers, as firms that are low skilled tend to underuse available financing, technology or policy assistance.

Organizational structure and management style dictate how SMEs distribute and prioritize strategic assets, assign tasks, engage customers, and incorporate experiential learning. SMEs often resort to informal decision-making when developing rapid responses. From a strategic perspective, this carries the risk of stifled, iterative, and orderly innovative activities. There exists a paradox of product and quality improvement. Motivation to improve and connect with customers amid market and competitive constraints exists. At the same time, cost competition, rapid market demand fluctuations, and product imitation restrict SMEs' innovative potential. Though advantageous to SMEs, public and operational policy constraints create a paradox of inefficient bureaucratic processes, costly compliance, bureaucratic policy measures, and ambiguous control mechanisms. Policymakers create operational instruments and measures for SMEs, but these intersect and function simultaneously. Though the fragmented innovation research focused on SMEs across various sectors of finance, management, human capital, digital, and market orientation, policies and regulation, this research aims to integrate and consolidate these studies. This study proposes the determinants of innovation challenges in SMEs.

2. Methodology

This study examined the drivers of innovation problems in small and medium enterprises (SMEs) using the systematic literature review approach. It was conducted in adherence to the PRISMA 2020 standards to ensure transparency and the replicability of results and methodical rigor in every step, including the assessment of the identification, screening, eligibility, and inclusion (Page et al., 2021). The nature of the SME innovation challenge research was originally published in multiple sectors including, finance, technology, human capital, and management. The review aimed to provide a holistic understanding of the effects of financial constraints, technological capabilities, human capital and skills, organizational and managerial factors, market and competitive pressure, regulatory and policy barriers, innovation capability, and industry type on the innovation challenges of SMEs. The study reviewed

literature covering the years between 2015 and 2025. This timeframe was chosen as an indication of the increasing scholarly concern on SMEs and the innovation challenges that arise due to the digital transformation, sustainability, market volatility, capability gaps, and institutional environment turbulence.

The search strategy primarily used the following terms: 'SMEs', 'small and medium-sized enterprises', 'innovation challenges', 'innovation barriers', 'innovation determinants', 'financial constraints', 'technological capabilities', 'human capital', 'skills', 'organizational factors', 'managerial factors', 'market pressure', 'competitive pressure', 'regulatory barriers', 'policy barriers', 'innovation capability', and 'industry type. I screened the principal academic databases and publisher sites, such as Scopus, Web of Science, ScienceDirect, SpringerLink, Emerald, Taylor & Francis, Wiley, IEEE Xplore, MDPI, and Google Scholar. I used Google Scholar for citation searches and for potential additional relevant studies.

Studies were published in English between 2015 and 2025, and focused on MSMEs or SMEs. These studies had to address one or more challenges, barriers, or determinants related to innovations, innovation capabilities, or innovation performance. Studies also had to connect to at least one of the major constructs of the review. Priority was given to peer-reviewed journal articles, although some select and warranted systematic reviews, high-quality conceptual, and/or empirical studies were included in the review. Studies that were published in English, and had clearly and concisely related to the selected variables were included in the review. Studies that were published in countries that spoke a different language were excluded. The review was conducted within a multi-staged selection process, which is outlined in the diagram, Figure 1. The first stage of the review, identification stage, yielded 268 citations from different databases and publishers. After the first citation screening, 142 records were excluded on the basis that these were not sufficiently SME-centered, did not address innovation challenges, or were not related to the determinant categories of the review. Out of the 126 articles left, at least 81 were excluded for lack of relevance for the SME innovation challenges. This meant that the 45 that were included were those focusing most directly on the challenges of innovation, SME improvement, and if the articles were substantiated either conceptual or empirical evidence of improvement and innovation.

A structured review matrix was employed to extract the necessary data. From the studies remaining after the initial selection, data was entered into the matrix to the level of detail as follows: author/contributor, the context of the research (in case of the studies performed at a country/region level), the type of research (design, sectoral, etc.), study approaches, and the study's relationship to the variables considered. Given the range of the studies engaged in research design, measurement, sector, and context, thematic synthesis was employed rather than meta-analysis. The purpose, appropriateness of the methods, and transparency of data collection and analysis were considered in terms of research and the problems faced in relation to the innovation of SMEs. In addition, the empirical studies were evaluated based on the clarity of analysis and coherence of measurements as well as studies that were based on reviews, which were evaluated based on the transparency of the process and logic of selection. The quality of the synthesis was also examined.

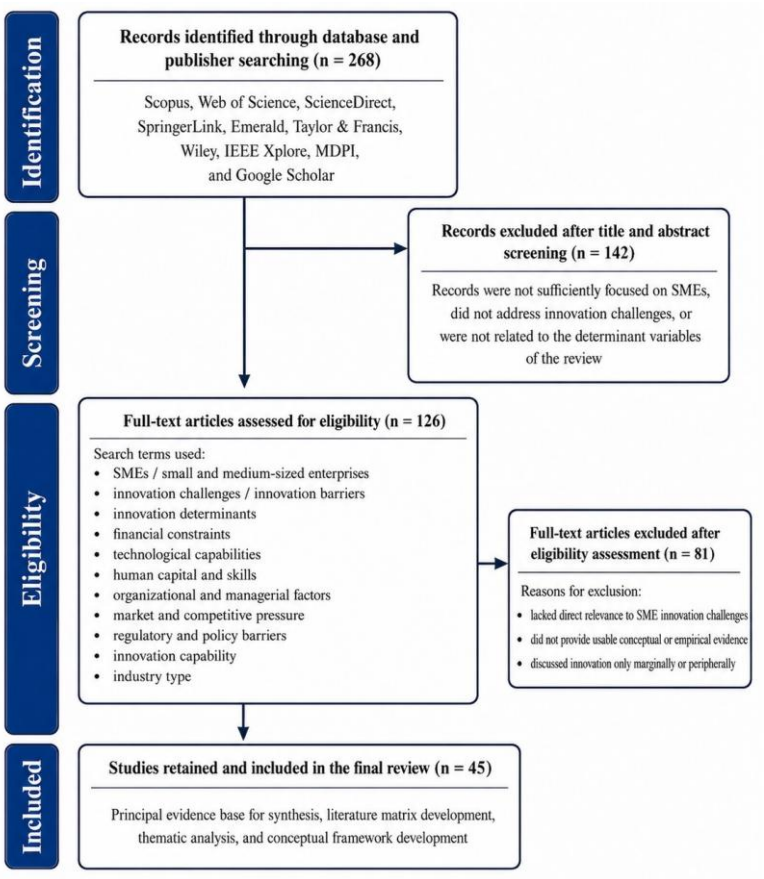

Figure 1: The Systematic Review Process

3. Innovation Challenges in SMEs

Challenges in small and medium-sized enterprises (SMEs) are complex and emerge from the interplay between internal and external factors. A unidimensional approach is not substantiated in the literature. Rather, multiple factors, namely finance, skills, management, market and regulatory pressures, policy support, and industrial context, determine the capacity of SMEs to convert ideas into tangible innovations. The review shown in Table 1, categorizes and demonstrates what previous studies have considered. Innovation capability is mainly viewed through the lens of the determinants of innovation and the challenges and performance outcomes. The existing literature is most robust on financial, human capital, and managerial technological and innovation capability constraints. Finance is cited most frequently because innovation activities demand financing for time, resources, and knowledge, and the process involves both trial and error along with commercialization. Knowledge management and human capital are also frequently cited because in most SMEs the owners' and managers' knowledge, with that of a small team, is the most significant. The post-2020 studies on the digital transformation of firms are on the readiness of and the digital skills of managers. The inconsistency in studies on regulatory burdens, and government policy support leaves significant room for new studies on sensitive institutional policies.

Table 1: Literature Review Matrix

No	Author(s) and Year	Finance	Digital Capital	Human	Managerial	Market Pressure	Regulatory	Policy Support	Knowledge	External	Innovation	Resource	Technology	Industry Context	Innovation
1	Love & Roper (2015)	✓		✓		✓				✓	✓	✓		✓	✓
2	Madrid-Guijarro et al. (2016)	✓									✓	✓		✓	✓
3	Hossain & Kaurane n (2016)		✓						✓	✓	✓	✓	✓		✓
4	Saunila (2016)				✓				✓		✓	✓			✓
5	Apanaso vich et al. (2016)					✓			✓	✓	✓			✓	✓
6	Kim et al. (2018)	✓		✓	✓		✓				✓	✓	✓	✓	✓
7	Genç et al. (2019)					✓				✓	✓			✓	✓
8	Saunila (2020)			✓	✓				✓		✓	✓			✓
9	Aydin (2021)		✓			✓							✓	✓	✓
10	Matarazz o et al. (2021)		✓		✓	✓				✓	✓		✓	✓	✓
11	Kaur & Kaur (2021)	✓		✓	✓				✓	✓	✓	✓			✓
12	Mendoza -Silva (2021)			✓	✓				✓	✓	✓				✓
13	Mushtaq et al. (2022)	✓	✓								✓	✓	✓		✓

No	Author(s) and Year	Finance	Digital	Human Capital	Managerial	Market Pressure	Regulatory	Policy Support	Knowledge	External	Innovation	Resource	Technolog	Industry Context	Innovation
14	Maroufkhani et al. (2022)	✓	✓	✓	✓							✓	✓	✓	✓
15	Troise et al. (2022)		✓		✓					✓	✓		✓		✓
16	Sabando-Vera et al. (2022)								✓	✓	✓			✓	✓
17	Chabbouh (2022)			✓	✓					✓	✓	✓			✓
18	Javed et al. (2022)	✓					✓	✓				✓	✓	✓	✓
19	Abdul Halim et al. (2023)			✓	✓				✓		✓	✓			✓
20	Escobar-Castillo et al. (2023)			✓	✓				✓		✓				✓
21	Deyassa (2023)				✓				✓	✓	✓	✓			✓
22	Albats et al. (2023)				✓				✓	✓	✓			✓	✓
23	Molina-García et al. (2023)	✓		✓	✓						✓	✓			✓
24	Kapepe & Malama (2024)	✓		✓		✓						✓	✓	✓	✓
25	Basit et al. (2024)	✓	✓	✓	✓		✓					✓	✓		✓
26	Marino-Romero et al. (2024)		✓	✓	✓				✓				✓	✓	✓

No	Author(s) and Year	Finance	Digital	Human Capital	Managerial	Market Pressure	Regulatory	Policy Support	Knowledge	External	Innovation	Resource	Technology	Industry Context	Innovation
27	Sagala & Őri (2024)	✓	✓	✓	✓					✓	✓		✓		✓
28	TanTai et al. (2024)					✓				✓	✓			✓	✓
29	Olaleye et al. (2024)				✓						✓	✓		✓	✓
30	Rakhmatullaeva (2024)			✓	✓				✓		✓				✓
31	Wojtaszek et al. (2025)	✓	✓	✓	✓	✓	✓					✓		✓	✓
32	Silva et al. (2025)	✓		✓	✓		✓				✓	✓		✓	✓
33	Tsakaleroou (2025)		✓	✓					✓	✓	✓			✓	✓
34	Kahveci (2025)		✓		✓					✓	✓		✓	✓	✓
35	Romero (2025)		✓	✓	✓					✓			✓	✓	✓
36	Cen & Lin (2025)	✓	✓								✓		✓		✓
37	Kannan & Gambetta (2025)		✓		✓		✓	✓				✓	✓		✓
38	Romero Alvarez et al. (2025)	✓						✓		✓	✓	✓			✓
39	Fasano et al. (2025)	✓								✓		✓			✓

No	Author(s) and Year	Finance	Digital	Capital Human	Managerial	Pressure Market	Regulatory	Support Policy	Knowledge	External	Innovation	Resource	Technolog	Context Industry	Innovation
40	Do (2025)			✓					✓	✓	✓				✓
41	Gulia et al. (2025)	✓		✓		✓	✓					✓		✓	✓
42	Clemente-Almendros et al. (2024)		✓	✓	✓								✓	✓	✓
43	Cassaro et al., (2024)		✓		✓	✓					✓		✓		✓
44	Feng & Jalali (2024)				✓						✓		✓	✓	✓
45	Nuryakin & Qamari (2025)		✓						✓		✓		✓		✓

Table 1 shows that the literature focuses on the following: innovation capability, human capital, technology readiness, and resource constraints. The literature views financial constraints as central, but the studies tend to group financial constraints alongside managerial capability, digital skills, and policy. This grouping suggests that finance acts as a constraint multiplier and is the most harmful when SMEs lack external networks, absorptive capacity, and technology readiness. The matrix shows that the industry context is a recurrent but poorly addressed topic. SMEs from the manufacturing, food processing, digital, and technology intensive industries will require different types of innovation. The studies on digital transformation focus on ICT and organizational learning, while studies on manufacturing focus on production technology, process upgrades, supply chain integration, and compliance.

3.1 Industry Type as a Moderating Force

SMEs will encounter different innovation challenges due to the diversity of sectors in terms of technological intensity, capital requirements, regulations, customer demand, and the life cycles of the products in the market. For Service SMEs, the barriers are digitalization and knowledge integration. For Foodprocessing SMEs, the barriers are safety, certification, and resource allocating. Most small technology firms will encounter high obsolescence and talent supply. Kapepe and Malama (2024) were able to locate the barriers of innovation capacity in Foodprocessing SMEs as obstructions of resource allocating and production. The moderating role of sector type is significant when analyzing the innovation capability of the company. Even if a company has a set of robust innovation sector barriers, the routines of

innovation will not either. Most of the sectors that are more controlled will face a dilemma of having the capacity of innovation and the knowledge of the compliance of the respective sector. For the technology-dominated sectors, the capacity of innovation depends more on the digital and technological skills. Most of the sectors face the dilemma of having the innovation capacity of the market. Most of the innovation barriers of technology SMEs are both inner and outer sectors in nature.

The nature of an industry also determines relevance of policy instruments. For some sectors, subsidies, digital training, tax credit, certification support, collaboration platforms do not tackling similar challenges. For instance, SMEs in manufacturing may necessitate equipment finance and production engineering support, in comparison to service SMEs, who may need data capabilities, digital marketing, and customer analytics. Therefore, policy and managerial interventions are expected to eliminate the universal approach but rather address the relative sectoral challenges. In support of this, Romero (2025) points out the need to incorporate the technological, human, and organizational-relational facets in the process of technology adoption in SMEs.

Table 2: Summary of Key Factors Influencing Innovation Challenges in SMEs

Category	Factors Identified in Literature	Interpretive Role
Resource Factors	Financial constraints, resource limitations, access to finance, investment uncertainty	Restrict the inputs required for innovation capability and increase innovation challenges.
Technological Factors	Technological capabilities, digital skills, technology readiness, infrastructure	Enable the acquisition, integration, and use of technologies that support innovation capability.
Human Factors	Human capital, skills, absorptive capacity, employee creativity, learning	Determine whether SMEs can recognize, assimilate, and apply knowledge for innovation.
Organizational Factors	Managerial support, leadership, strategy, measurement, routines, resilience	Convert resources and knowledge into coordinated innovation processes.
Environmental Factors	Market pressure, competitive intensity, regulation, policy support, industry type	Shape external opportunities, risks, constraints, and sector-specific innovation demands.

4. Discussion

The synthesis illustrates the complexity of the nature of innovation challenges in SMEs to be multiple systemic limitations instead of a single systemic challenge. From the synthesis, the most immediately identifiable challenges are a lack of financing, inadequate technological, human, and managerial capabilities, market and legal/institutional constraints. Together, these systemic challenges reinforce one another. While financial limitations hinder the firm from acquiring the necessary technology, having technology in the firm does not guarantee that innovation will take place, especially in the absence of skilled human capital. Despite the multifaceted nature of these challenges, the barriers most likely to contribute to innovation are market constraints. While numerous skilled human capital challenges and limited financial

resources may render the firm's management unable to focus and respond to the challenges, the lack of human capital may still be a positive challenge. Other regulatory challenges may enhance innovation, yet the firm's legal/institutional barriers will likely increase the unit costs from innovation. Thus, the firm's innovation capacity spells the legal/institutional, technological, human, and managerial resources. Saunila (2020) argues that the multidimensional nature of innovation of SMEs challenges explains this.

The review substantiated the value of a multi-theoretical analysis. Resource based logic explains why SMEs must obtain valuable resources like finance, skills, technology, and knowledge. Dynamic capability logic explains the necessity for those resources to be reconfigured as markets and technologies evolve. Absorptive capacity logic explains why the presence of human capital and the practice of knowledge management define the extent to which SMEs can exploit the potential of the external knowledge. Institutional logic explains the role of regulation and policy in determining the style of innovation. Contingency logic explains why the type of industry alters the strength and meaning of the relationship between innovation capability and innovation challenges. From a managerial perspective, the results suggest that SME innovation is not an activity that can be treated in isolation in the context of R&D. The construction of capability portfolios by managers is needed. A capacity finance solution that avoids skills development can be just as detrimental to innovation as the implementation of technology systems that are not assimilated learning. The expansion of markets that overshoots the development of managerial routines can be more detrimental than the absence of all SME factors combined. Thus, the SME of the managers assessed innovation readiness should consider the factors of finance, technology, skills, management, markets, regulation, and the specific risk of the industry.

The results highlight the risks of using blanket innovation support programs at the policy level. Considerable differences among SMEs by sector, size, age, level of digital readiness, and even compliance to the regulatory system exist. Policy tools should address the combination of the financial, educational, and advisory resources, access to technology, network and regulatory barriers, and offer simplified regulatory and procedural supports. When policy support is granted, the literature points to the fact that it should reduce several barriers at the same time, as opposed to simply subsidizing one element. Kannan and Gambetta (2025) advocate for the systems perspective as it describes the interdependent enablers and barriers of technology-based sustainability in SMEs. There are fundamental behavioral implications for both engineering and technology management. Disruption in SMEs calls for strategically synergistic investment in production systems, digital systems, skills, competencies and knowledge, systems of compliance, and systems of market intelligence. Engineering managers collaborating with SMEs should, first and foremost, diagnose systems to highlight the most critical aspects and then decide technology to intervene with. An, , underserved, or poorly aligned system of digital production alternative may, in fact, only serve to amplify the system of inability to produce educational and training resources. A more appropriate, system-level diagnosis is warranted, as opposed to a technology-pull.

5. Gap within Literature

Despite the various studies conducted about SMEs and their systems of innovations, the studies remain inconclusive relative to the many innovation hindrances. A plethora of studies concentrate on the finance, the digital systems, the human elements, the management, the networks of knowledge and their relationships, and the market, but rarely do these studies describe the interactions. Love and Roper (2015) described the innovation systems of SMEs as concerning both the internal qualifications and the external ecosystem specifics. Thus, we cannot explain the innovation hindrances of SMEs as isolated variables, because financial elements, the technology available, the human resources, the

organization, the market, and other institutional hinders reinforce each other. Tsakalerou (2025) expressed how the studies of the innovation systems of SMEs remain scattered on knowledge management, external networks, and digital transformation. Thus, a clear isolated approach to almost all of these various studies lacks a profound common framework to simplify the complexity of innovation hindrances.

The second gap involves the lack of formal thinking about innovation capability as a mediating mechanism. Current literature often regards innovation capability as an input to, or an output of, innovation performance or as a result of a firm's resources, managerial processes, or external forces. Saunila (2020) views innovation capability as a broad-spectrum ability that enhances innovation outcomes in SMEs. However, there is little consideration about the role of innovation capability in the conversion of internal and external factors into innovation dilemmas. Though SMEs may be subject to the same external factors, their outcomes may differ based on their ability to assimilate knowledge, manage resources, implement technologies, and monetize innovations. Mendoza-Silva (2021) points to the need for better understanding the role and evolution of innovation capability. Thus, it is important that future research assesses the extent to which innovation challenges are influenced directly or indirectly by finance, technology, skills, management, competition, and/or regulation through innovation capability.

The third gap pertains to the understudied role of industry type in SME innovation research. Many studies differentiate among manufacturing, services, food processing, and technology-based companies. However, there is a lack of studies that treat industry type as a moderator. Kim et al. (2018) explain that innovation capacity of manufacturing SMEs is impacted by facilitators and barriers in the context. Unlike manufacturing SMEs, which may lack process technology, production system upgrading, quality assurance systems, and supply chain integration, service SMEs may lack digital service design, customer experience, and data capability. Also, Marino-Romero et al. (2024) argue that digital transformation has greatly affected the management and innovation of SMEs. Food processing SMEs are losing management power, as food processing SMEs are under certification, compliance, and production capacity pressures. Finally, Kapepe and Malama (2024) explain the barriers to the innovation capacity of food processing SMEs. Therefore, the lack of industry-specific studies is a constraint that limits the generalizability of the findings and the sector-specific managerial and policy recommendations.

A fourth gap involves the relative neglect of regulatory and policy barriers as opposed to resource barriers viewed as financial, technological, and human resources. This does not imply that policy factors are less important. It is the case that most of the research about SMEs innovation directs the spotlight on organizational resources and not the policy factors. Javed et al. (2022) consider regulatory and institutional barriers to be major challenges for SMEs to embrace innovation. Future studies are encouraged to address the impact of regulatory intricacies, intellectual property safeguards, tax benefits, standards and norms, and the public procurement and grants availability on innovation across various activities in an innovative manner. The existing research is not only missing long-range studies with an emphasis on the vertical scale of time but also lacks comparison. The majority of studies do not even provide insights into the innovation propensity of the researched SMEs. Nuryakin and Qamari (2025) prove that technological and innovation capacity is critical for the improved performance of SMEs. This type of research would be valuable to understand how and in what manner SMEs progress from innovation constrained by circumstances to innovation driven by capabilities, as a result of building resources, networks, digital evolution, and learning from the markets.

6. Conclusion

This systematic review identifies determinants of innovation challenges in SMEs and consolidates

evidence from 45 studies published from 2015 to 2025. The results show that challenges SMEs face in innovation can be attributed to the following determinants: financial constraints; deficiency in technological capabilities; low level of human capital and competencies; organizational and managerial traits; market and competitive pressures; and physical regulatory and policy impediments. These determinants limit innovation and as result SMEs confront different challenges in the scope and level of innovation. The review substantiates the claim that the ability to innovate is the focal variable that explains why innovation constraints are transformed by some SMEs into adaptive innovation while persistent constraints are faced by others. SMEs that possess good innovation capability can effectively utilize scant resources, absorb knowledge and new technologies, react to market pressures, and deal with the challenges of regulatory protective mechanisms. However, innovation capability is not equally favorable. The type of industry tempers the impact of innovation capability, as certain sectors demand differ in market turbulence, capital intensiveness, compliance, or regulatory intensity.

For policy makers, it encourages segmented assistance to include funding, training, digital support, and simplification of the regulations and advisory services. For researchers, it offers hypotheses to be tested and further empirical studies to be conducted. The review is necessarily selective and has several limitations. Due to diverse methods in the studies, their comparison is limited. E.g. the review is mainly in English and publication wise, it is possible that the review is missing some literature studies in developing countries. The matrix literature review is of a broad nature and does not comment on the level of impact. Though the review is selective and has some limitations, it provides a rational basis for understanding what drives innovation obstacles for SMEs, and offers a basis to build and extend supports.

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